A DESCRIPTIVE SURVEY OF RENAL UNIT PRACTITIONERS' KNOWLEDGE, ATTITUDE AND PRACTICE RELATIVE TO USE AND EFFECTS OF UNFRACTIONATED HEPARIN IN SELECTED ADULT CHRONIC HAEMODIALYSIS CENTRES IN THE CAPE TOWN METROPOLE

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DECLARATION

I, Debra Jacqueline Ockhuis, hereby declare that the work on which this dissertation is based is my original work (except where acknowledgements indicate otherwise) and that neither the whole work nor any part of it has been, is being, or is to be submitted for another degree in this or any another university.

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Firstly, I dedicate my Master of Science in Nursing to all my past and present patients with end-stage kidney failure. Your plight has had a profound effect on my clinical practice over the years. Because of the hardship you endure as individuals, it encourages me every day to strive to become a better and safer nursing practitioner so that in return, I can encourage and empower my colleagues who render renal nursing care to you to become safer practitioners.

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ABSTRACT

Background: Chronic haemodialysis treatment of 3–4 hours' duration two or three times a week is the most common renal replacement therapy for adult patients diagnosed with stage 5 end-stage kidney failure. During the procedure 200-250 ml/minute of the patient's blood volume is extracorporeal and patency of the circuit is maintained by an anticoagulant, for example, unfractionated heparin (UFH). Incorrect dosage or time of administration of UFH can have serious adverse effects if not fatal consequences for patients. It is important to perform base-line clotting studies before the initial administration and subsequent doses of UFH. There is a paucity of published information on renal unit practitioners' knowledge, attitude and practice (KAP) concerning the administration of UFH globally and no published South African studies were located.

Aim: To describe renal unit practitioners' self-reported KAP regarding use and effects of UFH in purposively selected adult chronic haemodialysis centres in the Cape Town Metropole. Secondly, to determine whether there is an association between KAP regarding the use and effects of unfractionated heparin and selected variables (category of renal unit practitioner, years of experience, duration of orientation to the adult chronic haemodialysis unit and in-service education on the pharmacology of UFH).

Methods: A cross-sectional descriptive survey by self-administered questionnaire was undertaken. Non-probability convenience sampling was used and the data were analysed using descriptive and inferential statistics.

Setting: The study was conducted in the dialysis units of two tertiary government hospitals and in five dialysis units of one private dialysis provider.

Study population: Registered and enrolled nurses and (nephrology) clinical technologists working in the research settings.

Results: Of the 77 respondents (51 Registered Nurses, 21 Nephrology Clinical Technologists, 5 Enrolled Nurses), 58 (75.3%) were female. The mean age of 74/77 (96.1%) respondents was 41.1 years (range 23–64 years). The difference in age between RNs (mean age 44.9) and CTs (mean age 31.4) reached statistical significance (p<0.001) and between ENs (mean age 44.4) and CTs (p=0.002). Most respondents (41/77, 53.2%) had 0–5 years of experience. The odds of Enrolled Nurses having poorer knowledge of UFH than Registered Nurses were 18.7 times higher at a 95% CI (1.9-187.4) and this difference reached statistical significance (p=0.013). The odds of delivering poor practice having ≤ five years of experience and no in-service education were 4.6 times higher at a 95% CI (1.4–15.6) than for respondents who had ≥ six years of experience (the difference reaching statistical significance p=0.014) and 4.3 times higher (CI 1.1–16.5) than for respondents who did receive in-service education (the difference reaching statistical significance p=0.032) respectively. Study findings have implications for safety.

Conclusion: The results of this study suggest that professional category influences knowledge and use of UFH and that there is a direct relationship between years of experience and quality of haemodialysis practice and between having in-service education (on the pharmacology of UFH) and quality of haemodialysis practice.

Key words: adverse effects, attitude, chronic kidney disease, end-stage kidney failure, haemodialysis, knowledge, pharmacology, practice, renal unit practitioner and unfractionated heparin

CONCEPTUAL DEFINITIONS

Activated partial thromboplastin time: Test used to determine how long it takes whole blood to clot, used for heparin monitoring (Medline Plus, 2011).

Administration: Giving out or applying something (Soanes & Hawker 2008:12). That is, the method or route of giving medication.

Anticoagulant: Is an agent that stops blood from clotting (Dorland, 2007:103).

Adverse event: A negative situation arising from medical care that results in patient injury from unsafe care rendered, whether intentional or unintentional (World Health Organization, 2005).

Bioavailability: The rate at which, after administration, a drug or other substance becomes available at the targeted tissue (Dorland, 2007:219).

Chronic kidney disease/ end-stage kidney failure (synonym): Failed natural kidney functioning. Kidneys are unable to filter toxins and maintain fluid balance.

Chronic haemodialysis unit: Treatment centre where patients with end-stage kidney failure receive chronic haemodialysis.

Clinical Technologist: A person who has studied for a 3 year Diploma or a 4 year Bachelors Degree in Nephrology Clinical Technology and is registered to practice with the Health Professions Council of South Africa.

Dialyser: An artificial kidney, hollow in shape, made up of thousands of fibres with a semi-permeable membrane that allows blood to pass through, and surrounded by dialysate to assist in the blood purification process.

Dialysis centre or unit/ haemodialysis centre or unit (synonym): Terminology used interchangeably for ease of use.

Enrolled Nurse (synonym Staff Nurse): A person educated to practice basic nursing in the manner and to the level prescribed under the supervision of a

professional nurse (South African Nursing Council (SANC) Nursing Act, No.33 of 2005, 2005:chap2).

European Best Practice Guidelines (EBPG)/European Renal Best Practice (ERBP): In 2008, some board members of the European Renal Association-European Dialysis and Transplant Association Council changed the name of the initiative from EBPG to ERBP (European Renal Association-European Dialysis and Transplant Association (ERA-EDTA), n.d.).

Estimated glomerular filtration rate: Test to measure the level of kidney function and determine the stage of kidney disease (Kidney Disease Outcome Quality Initiative, 2006).

Glycosaminoglycans: High molecular weight polysaccharides composed of repeating disaccharide units in heparin (Dorland, 2007:805).

Heparin-induced thrombocytopenia: Platelets are broken down due to an allergic reaction to the drug heparin (Dorland, 2007:1947).

Knowledge: Information and skills gained through experience or education (Soanes & Hawker, 2008:562).

Medical litigation: A legal case against health care personnel for negligence, that resulted in harm to or the death of a patient.

Monitoring: Observe the progress to determine the outcome of treatment (Soanes & Hawker, 2008:657).

Nurse/renal unit practitioner: terminology used interchangeably to include all categories of respondents in this study, Clinical Technologists, Enrolled Nurses and Registered Nurses.

Oversulfated chondroitin sulfate (OSCS): Not found in biological sources, comes about in a sulphuric process from biological molecule and copies heparin qualities (Guerrini et al., 2008:672).

Registered Nurse (synonym Professional Nurse): Is a person who is qualified and competent to independently practice comprehensive nursing in the manner and to the level prescribed and who is capable of assuming responsibility and accountability for such practice (SANC Nursing Act, No.33 of 2005, 2005:chap2).

Renal unit practitioner: A specific category of staff: Registered Nurses, Enrolled Nurses and Clinical Technologists working in a haemodialysis centre.

Researcher's experience: The researcher's 23 years of Nephrology Nursing experience resulted in her achieving a wealth of knowledge, attitude and practice.

Thrombocytopaenia: Decrease in the number of platelets circulating in the blood (Dorland, 2007:1947).

ABBREVIATIONS

AHRQ: Agency for Healthcare Research and Quality

aPTT: activated Partial Thromboplastin Time

CDC: Centre for Disease Control

CI: Confidence interval

CKD: Chronic kidney disease

CT: Clinical Technologist

CVI: Content validity index

EBPG: European Best Practice Guideline

EN: Enrolled Nurse

ERBP: European Renal Best Practice

ESKF: End-stage kidney failure

HIT: Heparin-induced thrombocytopaenia

IHI: Institute for Healthcare Improvement

ISMP: Institute for Safe Medication Practices

IU: International Units

JCAHO: Joint Commission on Accreditation of Healthcare Organisations

KAP: Knowledge, attitude and practice

KDOQI: Kidney Disease Outcome Quality Initiative

NPSA: National Patient Safety Agency

OSCS: Oversulfated chondroitin sulphate

OR: Odds ratio

RN: Registered Nurse

SARS: South African Renal Society

STROBE: Strengthening the Reporting of Observational Studies in Epidemiology

UFH: Unfractionated heparin

US: United States

WHO: World Health Organization

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CHAPTER 1: INTRODUCTION

1.1 Introduction

This study examines renal unit practitioners' knowledge, attitude and practice (KAP) relative to the use and effects of unfractionated heparin (UFH) in the adult chronic haemodialysis population in purposively selected haemodialysis centres in the Cape Town Metropole. Even though UFH is beneficial to prevent clotting in the haemodialysis blood circuit, decades later there are still warnings of it being a high-alert medication (Institute for Safe Medication Practices [ISMP], 2006). For this reason, if safety precautions such as ensuring the right dose of UFH at the right time of administration and close monitoring are absent, serious adverse consequences can result. The National Patient Safety Agency (NPSA, 2006) in the United Kingdom, reported that anticoagulants are often the cause of preventable harm to patients, which can result in admission to hospital. The Institute for Healthcare Improvement (2008) reported that the Joint Commission on Accreditation of Healthcare Organisations (JCAHO) supported the initiation of the adoption of safety measures for anticoagulants. Hence, the JCAHO in the United States of America developed a project, 'Anticoagulation Therapy as a National Patient Safety Goal', which they implemented in January 2009 (JCAHO, 2009).

With the knowledge and skills involved in nursing advancing steadily, the development of high nursing standards using research and application of evidence-based practice in clinical nursing practice assists in improving patient safety and the quality of patient care delivered. This study will inform the Renal Unit Management teams and renal staff on the current KAP of renal unit practitioners concerning UFH, including whether any shortcomings exist.

1.2 Background to the study

Chronic kidney disease (CKD) describes deteriorating kidney function (Kidney Disease Outcome Quality Initiative [KDOQI], 2006). CKD classification is in

stages, depending on the estimated glomerular filtration rate (Hurst & Thomas, 2008:127) since this measures the normal functions of the kidneys (Hurst et al., 2008:127). The 2006 KDOQI guidelines affirm that stage one is to alert the renal unit practitioner that the person is at risk of potential decreased kidney functioning and at the extreme end, stage five indicates serious kidney failure, where the person requires supportive renal replacement therapy to survive. Chronic haemodialysis treatment is the most common renal replacement therapy for patients diagnosed with stage five adult end-stage kidney failure (ESKF). Patients with ESKF depend on safe, quality chronic haemodialysis treatment as a lifetime supportive therapy to survive until receiving a kidney transplant or death occurs.

The main purpose of chronic haemodialysis therapy is to restore the body's homeostasis. Patients on chronic haemodialysis have treatment for 3-4 hours' duration, two or three times a week, as prescribed by the Nephrologists. During the haemodialysis procedure 200-250 ml/minute of the patient‘s blood volume is extracorporeal. This predisposes a high risk to the patients' blood circulation, as the patient's blood is extracorporeal in the blood circuit of the haemodialysis machine and can therefore clot. The administration of an anticoagulant, such as UFH, is essential (South African Renal Society [SARS] 2006) and can assist in reducing the risk of the patient's blood clotting in the extracorporeal blood circuit (Roy & Kalra, 2012:107). However, even though the use of UFH is to prevent the danger of clotting, the patient is at risk of bleeding if the individualised dose of UFH administered is not appropriate.

Research by Winkler, Sheppard and Fantz (2007:499), reports that the efficacy of heparin will be determined by its bioavailability through its route of administration. Although an approximate 35% of UFH is filtered by normal kidneys for patients who are on chronic haemodialysis the excess heparin cannot be excreted, which means that heparin is not dialysable (Pittard, 2001:75). This is one reason why it is important for renal unit practitioners to be knowledgeable of the pharmacological aspects of UFH to minimise harm to patients (Schull, 2006:xv). The Institute for Healthcare Improvement [IHI] (2008) states that even though anticoagulants are

widely used, there continues to be errors and lack of tight control of the treatment of patients receiving anticoagulants.

1.3 Orientation to the field of study

"Heparin is frequently unmonitored, untested, and unsupervised in many dialysis facilities" (Pittard, 2001:75). The National Patient Safety Agency (NPSA) reported of 480 cases of patient harm from the use of anticoagulation therapy in the United Kingdom until the end of 2002 (NPSA, 2006). In addition, the National Patient Safety Agency (NPSA, 2006) reported that 28 reports of deaths were associated with the use of UFH. However, the NPSA report failed to mention whether any of the deaths related to patients on chronic haemodialysis. Essentially, UFH errors accounted for 2.1% of total records submitted to the Med Marx national error database, of which 4.5–5.5% were harmful (Niccolai et al., 2004:146S). Furthermore, in 2010 a study (Grissinger et al., 2010:195) focusing on patient safety and quality assurance retrieved electronic data regarding UFH from three large patient safety-reporting systems in the United States of America. The results were that patient harm from UFH accounted for 1.4% to 4.9% of the reports submitted, and most of the harm (56%) occurred in the administration phase (Grissinger et al., 2010:195).

Policy guidelines for monitoring baseline-clotting studies before the administration of the initial and subsequent doses of UFH were only available in one of the seven Cape Town Metropole dialysis centres under study. The other six dialysis centres had a patient prescription chart that the Nephrologist used to prescribe the patient's dose of UFH.

Additionally, five of the seven-dialysis centres had a protocol on how to administer UFH. Published statistical data from the Cape Town Metropole are not available on either adverse events or deaths of adult patients on chronic haemodialysis related to UFH. A valid explanation for the lack of evidence is that perhaps none occurred or were documented. On the other hand, the South African Renal Society does not have an active published statistical database on current

morbidity and mortality of the renal population in South Africa relating from anticoagulation therapy.

Anticoagulation therapy usage during haemodialysis is mandatory to prevent clotting in the extracorporeal circuit (South African Renal Society [SARS] 2006). In the dialysis centres under study, UFH is the anticoagulant of choice and in international published literature as well; this is supposedly due to proven efficacy, simplicity to administer and cost-effectiveness (Latham, 2006:548). In the SARS (2006) and other published guidelines the focus is on the dosage of UFH and not on the required KAP needed by renal unit practitioners.

The findings from this study will indicate trends in the KAP of this population of health care professionals. Secondly, it will assist in refining policy guidelines for practice relative to the use and effects of UFH and in designing in-service training programmes.

1.4 Problem statement

Renal unit practitioners have used UFH since the inception of chronic haemodialysis therapy in the 1930s. However, the published literature confirms that there is still confusion, controversy and concern about the preparation, administration, monitoring and safety aspects of UFH (Ouseph & Ward, 2000:181; Pittard, 2001:75; Baglin et al., 2006:21; Brunet et al., 2008:794). Under-or over-coagulation seriously compromises patient safety, yet globally knowledge and safety practices of renal unit practitioners who administer this medication to patients receiving chronic haemodialysis remain insufficiently documented.

1.5 Research questions

The research questions of this study were as follows:

1.5.1 What is the knowledge, attitude and practice (KAP) of renal unit practitioners relative to the use and effects of UFH in selected adult chronic haemodialysis centres in the Cape Town Metropole?

1.5.2 Is there an association between selected variables (category of renal unit practitioner, years of experience, duration of orientation to the adult chronic haemodialysis unit and in-service education on the pharmacology of UFH) and KAP of renal unit practitioners concerning the use and effects of UFH?

1.6 Aim of the study

The primary purpose of the study was to describe renal unit practitioners' KAP regarding the use and effects of UFH in selected adult chronic haemodialysis centres in the Cape Town Metropole.

The secondary purpose was to determine whether there is an association between selected variables (category of renal unit practitioner, years of experience, duration of orientation to the adult chronic haemodialysis unit and in-service education on the pharmacology of UFH) and the KAP of renal unit practitioners concerning the use and effects of UFH.

1.7 Specific objectives

1.7.1 The primary objectives of this study were to describe respondents' self-reported:

1.7.1.1 knowledge of UFH using a structured 6-item closed-ended and 7-item open-ended questionnaire (Appendix 1, Section C);

1.7.1.2 attitude regarding the use and effects of UFH using a structured 4-item closed-ended questionnaire (Appendix 1, Section D, Q23 - 26);

1.7.1.3 practice regarding UFH using a structured 5-item closed-ended and 4-item open-ended questionnaire (Appendix 1, Section E, Q27 - 35).

1.7.2 A secondary objective was to describe respondents' demographic and professional profiles and to determine differences between the groups (Appendix 1, Sections A and B).

1.7.3 Sub-objectives of the study were to determine whether there is an association between selected variables[1] and:

1.7.3.1 knowledge concerning the use and effects of UFH (Appendix 1, Section C, Q10 - 22);

1.7.3.2 attitude concerning the use and effects of UFH (Appendix 1, Section D, Q23 - 26); and

1.7.3.3 practice concerning the use and effects of UFH (Appendix 1, Section E, Q27 - 35).

1.8 The null hypotheses

1.8.1 Professional category of renal unit practitioner does not influence KAP regarding the use and effects of UFH.

1.8.2 Years of experience do not influence renal unit practitioners' KAP regarding the use and effects of UFH.

1.8.3 Duration of orientation to the chronic haemodialysis unit does not influence renal unit practitioners' KAP regarding the use and effects of UFH.

1.8.4 In-service education on the pharmacology of UFH does not influence renal unit practitioners' KAP regarding its use and effects.

1.9 Relevance of the study

The significance of a study relates to the possibility of it contributing to the body of scientific knowledge (LoBiondo-Wood & Haber 2006:51).

The researcher has 23 years of experience in Nephrology Nursing. During this period, she has noticed the uncertainty and confusion amongst renal unit practitioners concerning many aspects of the use and effects of UFH in chronic haemodialysis units. Concerns about the prescription, dosing, administration and

[1] Category of renal unit practitioner, years of experience, duration of orientation to the adult chronic haemodialysis unit and in-service education on the pharmacology of UFH.

monitoring the effects of unfractionated heparin also appear in the published literature (Ouseph & Ward, 2000:181; Pittard, 2001:75; Baglin et al., 2006:21; Brunet et al., 2008:794). Suranyi and Chow (2010:386) have appealed to dialysis clinicians to regularly review and update their knowledge regarding UFH. Shen and Winkelmayer (2012:483) suggest that "large scale studies (eg, cluster randomised trials) be conducted on contemporary cohorts" to confirm the safe therapeutic range for different anticoagulants against their risks and benefits.

Studies about renal unit practitioners' KAP, specifically regarding the use and effects of UFH, were not located in the available published literature. The data obtained from this study will add to the limited body of knowledge currently available by confirming what is known and adding new knowledge that can be explored in further research. Locally, the study findings will be useful for providing relevant content designing in-service training programmes for renal unit practitioners to promote patient safety and improve the quality of renal care delivered. This study attempts to fill this theoretical gap.

1.10 Format of the dissertation

The study consists of five chapters, as outlined below.

Chapter 1 presents the introduction, background, orientation, problem statement, aims and objections, hypothesis, relevance of the study and format of the dissertation.

Chapter 2 covers the literature review regarding the pharmacology, dosage and monitoring relating to UFH, KAP in general and relating to medication, and the theoretical framework of the study.

Chapter 3 describes the chosen research methodology.

Chapter 4 discusses the results of the study.

Chapter 5 discusses the findings in relation to the published literature, strengths and limitations of the study and implications, recommendations and conclusion.

1.11 Summary

This chapter discussed the need to study renal unit practitioners' KAP relative to the use of a high-alert medication such as UFH in the context of a paucity of published studies in this field.

This study has attempted to contribute new knowledge about trends in renal unit practitioners' practice concerning the use and effects of UFH for the promotion of patient safety and informing the staff in-service education programme.

In the next chapter, the published literature that was reviewed to inform the need for such a study on the KAP of renal unit practitioners relative to the use and effects of UFH is presented, and the gaps in the existing literature are outlined.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

A literature search was conducted to gather information on available current and past studies on the KAP of renal unit practitioners regarding the use and effects of UFH and to identify gaps in the published literature, relating to the research topic. The search strategy is described below.

Search strategy

Only the literature published in English was included in the review. Keywords (Table 2.1) were used to locate relevant publications via the available electronic databases of the University of Cape Town (UCT)'s Health Science library and Google and Google Scholar search engine to inform the purpose of the study. In addition, applicable Nephrology textbooks were consulted. Additional journal articles were sourced from the references in journal articles that were reviewed and used in the study. The UCT Harvard method of referencing was used for in-text citation and in the reference reporting section.

Limited published studies on UFH were sourced from South Africa. The contribution that the two South African published studies that were located would make to inform the study research question, aims and objectives was considered minimal and these were not included. This led to an exploration of International online articles relating to UFH, KAP studies and general medication studies on administration, monitoring, adverse effects/events and medication calculation. For this study, peer and non- peer reviewed e-journal articles from nursing and other medical disciplines were evaluated. Published articles on anticoagulation therapy that focused on low molecular weight heparin and other alternative forms were excluded. However, articles accepted for review were those relating to both UFH and low molecular weight heparin, with the concentration focused on the UFH section. Although all anticoagulants are used to minimize blood clotting, the administration, dosage, monitoring and adverse effects are different. Secondly this is not a comparison study between the different types of anticoagulation therapy,

but a focus of UFH which is most commonly prescribed anticoagulant for patients on haemodialysis. UFH is the anticoagulant of choice and in international published literature as well; this is supposedly due to proven efficacy, simplicity to administer and cost-effectiveness (Latham, 2006:548).

E-journal articles on Benner's theory model, including critiques of her model, worldwide renal guidelines and safety agencies' concerned with UFH and anticoagulation therapy were downloaded for evaluation.

Excluded from review were published literature on paediatric renal patients, peritoneal dialysis patients and kidney transplant patients related to the current study theme (UFH).

Table 2.1: Literature search strategy

Database/search engine	Keywords	Papers downloaded for review	Number of papers used
EBSCO CINAHL	Adverse events drug administration	16	10
	Nurses' attitudes AND perception of medication	18	3
	Nurses' knowledge of medication	10	2
	Nurses' medication practices	7	2
	Nurses AND UFH	6	6
	KAP studies on medication	20	4
	Benner's nursing theory	9	9
	UFH	15	11
Google	KAP studies	10	3
	South African Renal Guidelines	1	1
	Renal units' UFH guidelines	5	4
	UFH litigation	2	2
	Patient Safety Agencies	12	12
	South African papers published on UFH AND anticoagulants	2	0
	STROBE checklist	3	1
Google Scholar	UFH point of care testing	2	2
	UFH South Africa	0	0
Medline Pubmed	Benner's nursing theory	10	4
	UFH	20	9
	Anticoagulants	15	5
Total		183	90

Publications between the years 1993 and 2013 were reviewed but due to the paucity of published KAP studies, cited references provided additional sources of information. Classic publications particularly those describing theoretical models

date from the 1980's and others that informed the methodology section were included.

Available local and international renal guidelines do not include nor suggest methods to improve or standardise the KAP of renal unit practitioners regarding the high-alert medication UFH. The guidelines appear to focus on other aspects, such as UFH dosage and frequency. Shen and Winkelmayer (2012:473) report that in the United States of America there is no standard heparin dose for administration in haemodialysis patients and little is known about the safety aspects of UFH in haemodialysis.

However, international health organisations (NPSA, 2006; ISMP, 2006; Institute for Healthcare Improvement (IHI), 2008; Agency for Healthcare Research and Quality (AHRQ) n.d.) are appealing for safer practice relating to UFH. The appeals are specifically to the personnel administering and monitoring the use and effects of UFH, to minimise the unnecessary complications experienced by patients receiving it. Niccolai et al. (2004:146S) emphasise the need to solve problems relating to UFH monitoring. This sentence added to the relevance section of the study.

There is an appeal (Suranyi & Chow, 2010:386) for dialysis clinicians to regularly review and update their knowledge regarding UFH. Nurses (renal unit practitioners) are the front-line administrators of drugs to patients (Feldman, 2006:ix). They should be aware of adverse drug events and how they can prevent patients from experiencing the negative consequences of drug administration or from the prescribed drug dose (Feldman, 2006:ix; Ndosi & Newell, 2008:572). Essentially, nurses (renal unit practitioners) should have an adequate knowledge of medications and an easily accessible source of current drug information to identify adverse drug events (Wimberley & Wiggins, 2004:47; Feldman, 2006:ix).

A review of the published literature does provide a strong basis for research and/or evidence-based practice projects (LoBiondo-Wood & Haber, 2010:16), such as this study on the KAP of renal unit practitioners regarding UFH. In

essence, using a systematic approach in the search for published peer-reviewed journal articles, textbook information, computer-accessed material and audiovisual material pertinent to the study (KAP of renal unit practitioners regarding UFH) assisted in evaluating studies on the subject matter and their outcomes, and the gaps became evident (LoBiondo-Wood & Haber, 2010:57).

A review of nephrology nursing and medical literature relating to UFH was undertaken. This included KAP studies to support the discussion in chapter one: to be alert to and provide evidence of the potency of UFH used routinely in adult chronic haemodialysis patients. As well as a discussion of the overview of the literature, a review of methods for KAP surveys, maintenance of quality assurance of the study, adoption of Benner's theoretical framework, general medication studies, medication adverse effects studies, medication KAP studies and the pharmacological aspects, dosage and administration of UFH were all reviewed to inform the study.

2.2 Literature review to determine methodology

A descriptive KAP survey by self-administered questionnaire was purposively selected, because it was important to collect information that accurately described (World Health Organization (WHO), 2008; Bowling, 2009:214; Neuman, 2011:38; Unite for Sight, 2000-2011) the renal unit practitioners' unprejudiced perspectives regarding UFH. Renal unit practitioners administer UFH daily to their chronic haemodialysis patients. There is a possibility that each renal unit practitioners' patient allocation is a minimum of 4–5 patients per session (a dialysis session is normally 4 hours). This depends on the dialysis unit protocol and number of patient sessions (a day can have one, two or three shifts), implying that they will be administering UFH to 8–12 patients per day.

Using a self-administered questionnaire to collect their responses ensured no influence by factors such as interviewer bias and them having their identity known (Bowling, 2009:285). To design the questions for the questionnaire, a search was conducted on published literature on KAP surveys. The WHO (2008) reports that

KAP studies reveal natural, non-manipulated information about what the personnel know about a certain phenomenon, person or thing. Gathering this collected data will allow the identification of the knowledge gaps of renal unit practitioners, their needs [attitude], and the problems [clinical practice] they experience, as well as barriers encountered (WHO, 2008).

Analysing the data collected will assist in the design of effective solutions for improving quality of delivered (renal) care and (renal) patient safety (WHO, 2008) regarding UFH. Whether it is trial and error or evidence-based, the WHO (2008) affirms that it is important to maintain patient safety and improve patient outcomes, and this directly improves safe nursing practice (Melnyk & Fineout-Overholt, 2005:5).

A survey is a non-experimental approach to collecting information on people's actions, knowledge, intentions, opinions, attitudes and values (Polit & Hungler, 1993:148; Neuman 2011:49). Literature states that there is a hierarchical system for weighing evidence. Supposedly, a survey is non-experimental and produces level IV evidence (LoBindo-Wood & Harper, 2010:196). This is confirmed by Melnyk and Fineout-Overholt (2005:10) as being classified as level IV evidence because it comes from case-control and cohort studies (Table 2.2), which in essence are non-experimental design methods (Melnyk & Fineout-Overholt, 2005:256). Level IV evidence is not as strong as that produced from systematic reviews or meta-analyses of randomised controlled studies (Melnyk & Fineout-Overholt, 2005:10). Nevertheless, the "information yielded by these studies [surveys] is critical to developing evidence based in [nursing] practice and may represent the best evidence available to answer research or clinical questions" (LoBindo-Wood & Harper, 2010:196).

The data in Table 2.2 represent the hierarchy of an evidence rating system according to Melnyk and Fineout-Overholt (2005:10).

Table 2.2: Hierarchy of evidence rating

Level	Hierarchy of evidence	Strength of evidence
I	Evidence from a systematic review or meta-analysis of all relevant randomised controlled trials (RCTs), or evidence-based clinical practice guidelines based on systematic reviews of RCTs	Strongest  Weakest
II	Evidence obtained from at least one well-designed RCT	
III	Evidence obtained from well-designed controlled trials without randomization	
IV	Evidence from well-designed case-control and cohort studies	
V	Evidence from systematic reviews of descriptive and qualitative studies	
VI	Evidence from a single descriptive or qualitative study	
VII	Evidence from the opinion of authorities and/or reports of expert committees	

Adapted from Melnyk & Fineout-Overholt (2005:10)

Polit and Hungler (1993:27) proposed that persons completing a study questionnaire are called respondents instead of participants, therefore for this reason the renal unit practitioners completing this study questionnaire are called respondents (Polit & Hungler, 1993:27) and not participants. It is worth noting that data gathering is deemed the most challenging part of a study, as without high-quality data collecting methods, the accuracy and reliability of the research outcomes will not be credible (Polit & Hungler, 1993:200). For this study a self-administered questionnaire was employed and chosen for the following reasons (Polit & Hungler, 1993:205):

- It allows the respondents' anonymity and, privacy to participate in the study.
- Absence of the researcher ensures no bias in responses.
- Less cost, less time, including less energy to administer.

As much as there are benefits to conducting a survey using a self-administered questionnaire, the researcher is aware of limitations such as the following:

- Poor response rate because not all renal unit practitioners involved in administering UFH will participate,
- Some staff will be on annual leave or sick leave, and
- Staff will not want to expose their true KAP regarding UFH.

Since it is not feasible to study all renal unit practitioners in South Africa, this study employed a purposive sampling method to include respondents working in the Cape Town Metropole haemodialysis centres and who daily administer UFH to patients receiving haemodialysis (Polit & Hungler, 1993:179). The selection of respondents in purposive sampling can affect the sample size. According to Polit and Hungler (1993:184) and Strydom (2011:234), the sample size has to be large enough to represent accurately the size of the entire study population, therefore limiting bias, preventing inaccurate findings, and sampling errors.

Determining the power analysis ensures an appropriate selection for the sample size of the population under study and whether there are significant, differences present (Burns & Grove 2001:497). Undertaking this will prevent type II errors from occurring and non-rejection of the null hypothesis, even though differences do exist between groups (Burns & Grove 2001:485). Equally important is that the study needs to have scientific rigour, which refers to “the ideas, rules, techniques and approaches” (Neuman, 2011:17) to ensure that the findings are credible. To ensure accuracy, data tools needed validation. Therefore, as a measure of the validity of the tool, the chosen device needs to measure what it intends to, without it being “erratic, inaccurate and inconsistent” (Polit & Hungler, 1993:249; Leedy & Ormrod, 2005:28; Babbie, 2007:146).

Two aspects to determine the validity of the tool to be used are content and face validity. Content validity looks at the sampling adequacy of the content area (KAP questions) being measured. How valid is the representation of the specific content of study for UFH. Content validity is based on judgement. Although it is reported that there is no objective method to evaluate whether there is sufficient coverage of the research topic (Polit & Hungler, 1993:250), Lynn (1986:382-385) provides guidelines to establish the index of content validity of a questionnaire. Face validity on the other hand is the unscientific, unassuming explanation of validity and describes the visual aspects of looking at an instrument to validate that it appears to measures what it supposed to be measuring and adds value for validity testing of an instrument (Delport & Roestenburg, 2011:174). Furthermore, it is stated that face validity and content validity should not be thought of synonymously as

measuring the same aspects because they do not (Delport & Roestenburg, 2011:174).

Upon completing the validity testing of the instrument, the reliability test is performed using a pilot study to establish whether results are consistent when measured by different persons and often, and at different times (Delport & Roestenburg, 2011:177).

2.3 Quality assurance of the KAP cross-sectional study

Globally there is a concern about the poor quality of reporting of study results, so a number of guidelines and checklists have been published to ensure improvement. Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) is one such checklist, and the STROBE initiative group concurs that "poor reporting hampers the assessment of the strength and weakness of a study and the generalisability of the results" (Vandenbroucke et al., 2007:805). The cross-sectional study design (Vandenbroucke et al., 2007:805) was one of three methods included in the STROBE checklist, and provided guidance on how to improve the standard of quality reporting of the observational study. Because the present study utilises a descriptive cross-sectional design approach, the STROBE checklist was appropriate as a quality control measurement instrument. Use of the STROBE checklist ensured transparency in reporting the action plan, how the study was performed and the relevant findings (Vandenbroucke et al., 2007:805).

Since no published KAP study by nurses and/or renal unit practitioners' for UFH administration was located, the next section discusses the conceptual framework for this study, medication KAP surveys in general, and pharmacological aspects of UFH.

2.4 Conceptual framework

A conceptual model serves the purpose of "broadly explaining phenomena of interest, expressing assumptions, and reflecting a philosophical stance" (Burns & Grove, 2005:39). The versatility of Benner's model of staged nursing competence,

from novice to expert as diagrammatically displayed (Figure 2.1), was appropriate for this study for expressing assumptions and to guide the interpretation of renal unit practitioners' self-reported KAP regarding UFH (Benner, 1984:v).

Figure 2.1 shows the repetitive cycle of the five stages from novice to expert, which changes in a new field of work.

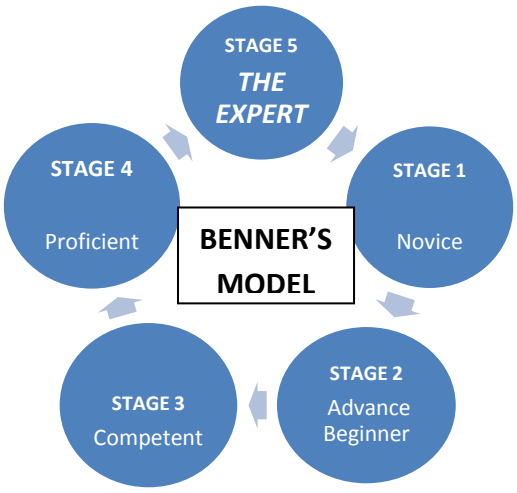

Figure 2.1: Diagrammatic representation of the cycle of the five stages from novice to expert, adapted from Benner (1994).

Benner's model was originally conceptualised by Professors Dreyfus and Dreyfus in 1980, however, she adapted it for use in nursing practice with their approval. Shapiro (1998:18) articulated that Benner's model guided the professional development of nurses (renal unit practitioners), enabling them to move up the clinical ladder to attain expertise and reap the financial and professional rewards. Thomes (2003:334) confirms that by reviewing each of the stages of Benner's model from novice to expert, the nurse (renal unit practitioner) can communicate how the progression of skill acquisition is attained, with the novice finally becoming expert.

The following aspects relating to Benner's model are discussed:

- History of the development of Benner's model;
- The various stages of Benner's model;
- Rationale for the application of Benner's model to nephrology nursing; and

- Limitations of Benner's model.

2.4.1 History of the development of Benner's model

After observing the "imperfections" and "contingencies" (Benner, 1984:xvii) which nurses dealt with daily in their clinical nursing practice, Benner developed her competency model. She consulted with Professors H. L. Dreyfus and S. E. Dreyfus regarding adopting their 'Five-Stage Model of the Mental Activities Involved in Directed Skill Acquisition' to apply in clinical nursing practice (Benner, 1984:xxvi).

Aydelotte (cited in the foreword, Benner, 1984:v) commended the Benner model for aptly distinguishing differences between experts' and beginners' behaviour in different specific patient situations. Benner had interviewed nurses to gain a deeper understanding of their level of competence (Benner, 1984:xvii). She found that self-perception plays a role in expert nurses' awareness in nursing judgement. Benner did not want skills acquisition to be depicted as advocating trial and error learning, being disorganised, fostering a poor doctor/nurse relationship and bestowing the 'expert halo-effect' status. According to Standing (2004 cited by Lewis-Beck et al., 2004:452), the 'expert halo-effect' status bestows indelible credibility on a person's physical or personality traits, ranking the person's abilities high above that of others.

She reports that "experience based skills acquisition" is safer and quicker when it "rests upon a sound educational base". Benner clearly affirms that her competencies are "not an end but a beginning", and that there is no need for nurses to rush through the competencies, but rather "to encourage nurses to collect their own exemplars and to pursue their line of inquiry and research questions raised by their own clinical knowledge" (Benner, 1984:xvii-xxii).

2.4.2 Stages of Benner's conceptual model

Following the tenets of the Dreyfus model, Benner described the different performance levels of nurses in five stages, which are outlined below.

2.4.2.1 Novice practitioner

In this stage, Benner's analogy of a novice is that it can relate to new nursing students or nurses entering a new discipline of nursing. The presumption is that although a nurse may be an expert in another area of nursing, they will be considered as a neophyte in the new discipline, because the nurse lacks sound expertise (Benner, 1984:22). A novice nurse operates according to the textbook. Similarly, this is how a new renal unit practitioner behaves when he or she commences working in the haemodialysis unit (Ulrich, 2011:9).

A novice nurse practical and theoretical knowledge, attitude and skills are lacking and thinking is tunnel vision. The new practitioner often feels insecure about capabilities, and follows verbal or written instructions without interrogation. Practice is context-free for ease of understanding and interpretation until competency is achieved (Benner, 1984:20-22). Hardt (2001:40), in reference to Benner's (1984) model, proposed that a nurse would progress from novice to an advanced beginner over an 18-month period.

2.4.2.2 Advanced beginner practitioner

In this stage, Benner's model proposes that some experience has been gained by the nurse. The nurse's knowledge, attitude and clinical practice have improved to the extent that he/she can assume responsibility for some aspects of patient care. The nurse practitioner's focus is on getting work done adequately (Benner, 2004:198). However, the nurse still needs guidance from an expert to prioritise nursing care, thereby reducing general anxiety and fears and ensuring no harm comes to the nurse or patient.

In clinical practice when different patient situations arise, the nurse gains experiential learning (Benner, 1984:22-24) on how to manage the patient situation on hand and in the future. This experiential learning can only be gained in clinical practice when different patient situations arise (Benner, 1984:22-24).

2.4.2.3 Competent practitioner

Benner's model cites two years of experience for the competent practitioner. In her book '*From Novice to Expert*' (Benner, 2004:25), Benner suggests that a

competent person can be a nurse who has spent two or three years in a similar clinical practice area and has the ability to set her own long-term goals. However, a practitioner can progress to a competent level after one to two years of practice, depending upon the specialty area, but some complex patient assignments will occur after a certain time has elapsed (Benner, 2004:193).

With the years of experience gained, the nurse evolves from a stimulus-response person to being consciously involved in the analytical clinical decision-making process regarding patient care (Benner, 1984:25-26). The nurse feels that he/she is a master of their clinical specialty and can coordinate complicated patient care (Benner, 1984:25-26). However, this nurse's anxiety level is now directed towards specific patient situations, but the gaps experienced by this nurse are the lack of speed and flexibility that evidently the proficient nurse practitioner demonstrates (Benner, 1984:25-26).

2.4.2.4 Proficient practitioner

As a proficient practitioner, the nurse has gained a deeper understanding of specialty patient care in totality and has the ability to synthesise knowledge and skills abstractly (Benner, 2004:195). This practitioner is more attuned to patient needs and concerns and accordingly adapts patient care, delivered according to a more holistic approach (Benner, 1984:28; 2004:196). Benner proposes that the practitioner has an open attitude to correction, seeks answers to difficult patient care situations, and intuitively knows when a situation needs further intervention (Benner, 2004:195).

Furthermore, Benner (1984:31) deduces that proficient practitioners are those who have worked 3–5 years with a similar patient population, but acknowledges that this period is an estimate and needs further exploration.

2.4.2.5 Expert practitioner

Benner cites Taylor's (1991) description of an expert as a person who "takes up theories and ends of practice in multiple ways, often creating new possibilities in the situation" (Benner, 2004:196). This nurse practitioner has substantial experience, mastery of skills, self-sufficiency and "an intuitive grasp" (Benner,

1984:32) of various patient clinical situations. Without wasting time this practitioner can swiftly assess the situation, diagnose the problem, decide on an action and implement a plan of action (Benner, 2004:196). This prompt delivery of an action plan minimises adverse patient reactions (Benner, 2004:197). The expert nurse has been working in the same specialty for at least 5 years (Benner, 1984:35). This person acts as a consultant to other practitioners of the same specialty because their clinical judgements are valued (Benner, 1984:35).

Interestingly, Benner proposes that not all practitioners will reach this expert stage, as some may struggle with "understanding the goals of practice and have challenges with their skills of interpersonal and problem engaging" (Benner, 2004:198).

2.4.3 Rationale for application of Benner's model

According to Benner (2004:188), she and other researchers conducted three studies spanning different intervals over the period 1978 until 1997 on skills acquisition in nursing. Application of the Dreyfus model of skill acquisition and direct consulting with Professors Dreyfus and Dreyfus guided her work for each of the studies carried out over this period (Benner, 2004:188).

Benner's (1984) 'Novice to Expert' model was considered appropriate for analysing data from this study to establish the stage of respondents' clinical practice which, it was presumed, would range from little experience to vast experience.

This study is a descriptive survey of renal unit practitioners' KAP regarding the medication UFH. The primary purpose is to describe renal unit practitioners' KAP regarding the use and effects of UFH. The secondary purpose is to determine whether there is an association between category of renal unit practitioner, years of experience, duration of orientation to the adult chronic haemodialysis unit and in-service education on the pharmacology of UFH and the KAP of renal unit practitioners concerning the use and effects of UFH.

The null hypotheses are that the type of professional category, years of experience, duration of orientation to the chronic haemodialysis unit and in-service education regarding the pharmacology of UFH do not influence renal unit practitioners' KAP regarding the use and effects of UFH.

Therefore, the application of Benner's model to the study will assist in gaining a perspective on whether this 'from novice to expert' model does have an association with renal unit practitioners' KAP regarding UFH. Avillion and Abruzzese (1996:36) and Ulrich (2006:16) from the United States of America suggest that as practitioners adjust to a clinical specialty and become more skilful at performing routine tasks, they search and expand their knowledge level in the clinical specialty, which results in a shift from routine thinking to critical thinking and judgement in decision-making. Furthermore, an important point to note is that Benner strongly conveys the message that it is the responsibility of the nurse to monitor the patient's safety and therapeutic responses to administered medication, and that this can have life and death implications (Benner, 1984:127).

Avillion and Abruzzese (1996:30) and Ulrich (2006:15) from the United States of America affirm that Benner's model is widely adopted for practice across the spectrum of nursing and other medical disciplines. Furthermore Ulrich, a Nephrology specialty nurse researcher from the United States of America seems to support using Benner's model 'novice to expert' in Nephrology Clinical Nursing Practice (Ulrich, 2006:16; 2011:9).

2.4.4 Limitations of Benner's model

Benner's model has been criticised by others as not being a theory but a philosophical view (Altmann, 2007:114). Altmann (2007:114) claims that in the literature there is no consensus that Benner's model is a theory, alleging that Benner's work is critiqued as not being theoretical and quantitative because it relies too heavily on narrative research (Altmann, 2007:115-116).

Gobet and Chassy (2008:132) from the United Kingdom argues that Benner's theory is too simple to account for complex patterns involved in nursing. They

(Gobet & Chassy, 2008:131) further highlight flaws of Benner's model, such as that some of her competencies listed in different stages require access to explicit knowledge, and that she does not appropriately account for expertise and intuition. This is in comparison to empirical data; her assigning of nurses to stages is not reliable and does not correlate with expertise. Furthermore, Bonner and others (2003, 2005 & 2006) from Australia, who studied nephrology (renal) nurses' levels of expertise, suggest that there are not five stages that lead to a nurse becoming an expert as suggested by Benner (1984), but three stages – namely the non-expert, experienced non-expert and expert.

Although these researchers have interrogated Benner's model, the suitability of the application of Benner's model to nephrology nursing will be reviewed upon the completion of this study.

2.5 General medication KAP surveys and adverse effects

A literature review shows that there are published medication KAP studies but none specific to KAP relating to UFH. Therefore, a general overview of medication studies, medication adverse effects studies and medication KAP studies is discussed.

2.5.1 General medication studies

A United Kingdom nurse's knowledge of pharmacology study conducted "in surgical wards of a foundation hospital in the North of England" (Ndosi & Newell, 2008:570) reported that 57.2% (n=24/42) of their study nurses had inadequate knowledge of pharmacology of the drugs they routinely administer. In addition, a cross-sectional study limited to nurses working in general hospitals of the Northern, Central and Southern areas of Taiwan reported on nurses' knowledge of high-alert medication (Hsaio et al., 2010:177). The report stated that 3.6% (n=109.8/305) thought they had sufficient knowledge, 75.4% (n=229.9/305) felt their knowledge was insufficient, and 84.6% (n=258/305) hoped to gain further education (Hsaio et al., 2010:177).

The findings of these studies (Ndosi & Newell, 2008; Hsaio et al., 2010) recommend that nurses should strive continuously to update their medication knowledge with supplementary pharmacology education programmes to be competent in medication administration.

2.5.2 Medication adverse effects studies

Research reports adverse drug [medication] reactions as being negative consequences of drug (medication) therapy (Rao, Archana & Jose, 2006:293). A study by Hanafi et al. (2012:21) showed that 91% of nurses had never reported an adverse drug reaction (ADR) directly to the Adverse Drug Reaction National Centre due to being unaware of the Centre's existence; however, they are most likely to report them to the doctors (87.1%) and pharmacist (1.8%). A factor to consider for non-reporting directly to the database could be because nurses fear reprisal (Niccolai et al., 2004:148S) as they are blamed, and attention is not paid to the processes (Walker & Lowe 1998:101).

Hanafi et al. (2012:24); recommend holding interventions such as pharmaco-vigilance workshops to create better awareness of adverse events. A Chinese study conducted in 2004 reports that lack of knowledge on ADR and the voluntary reporting system are the main reasons for insufficient reporting (Li et al., 2004:856). Furthermore, a KAP semi-experimental study (Hajebi et al., 2010:205) on ADR reports that continuous ADR education programmes are important until ADR reporting becomes habitual among nurses. This implies that diligent reporting will reveal the true extent of medication/drug (UFH) adverse reactions.

A multinational systematic review of empirical evidence on the prevalence and nature of medication administration errors in health care settings showed a higher medication administration error (53.3%) in the intravenous route (as used with UFH) compared to other routes (Keers et al., 2013:1). The study reports that "medication adverse effects remain common despite the growth in improving medication safety" (Keers et al., 2013:11).

2.5.3 Medication KAP studies

A Malaysian general medication KAP study among 40 nurses working in a medical ward showed that nurses possess adequate medication knowledge (mean scores: knowledge 13.8, attitude 16.4, and practice 10.7) but lacked in-depth knowledge of aspects of pharmacology (Raja, Daud & Syed, 2009:17). A study by nurse lecturers, Barkhouse-Mackeen and Murphy (2013:91) on "innovative strategies for enhancing medication related knowledge, attitude, skills and behaviours" came about after recognising shortcomings in teaching pharmacology to nursing students. They reported poor student performance in medication calculation (Dillies et al., 2011:499), poor pharmacology knowledge retention (Dillies et al., 2011:499) and practical implementation in clinical areas. To properly prepare these nursing students for their "role in medication management" in the clinical areas, they developed a 13 week pharmacology course and employed a pharmacist to teach the pharmacology course (Barkhouse-Mackeen & Murphy 2013:92). Their findings revealed that students appreciated their innovative teaching strategy of pharmacology and this enhanced the students' ability to "exercise clinical reasoning with regard to application of the medication related knowledge and skills". Another positive outcome was that students were achieving 100% passes in medication calculations quiz (Barkhouse-Mackeen & Murphy 2013:99-100).

A study by Dilles et al. (2011:499) on 29 nursing schools' pharmacology curricula, found that the mean score for nursing students' knowledge on pharmacology was 55%, and for calculation skills was 66%. McMullan, Jones and Lea (2010:891) results from their 2006 United Kingdom study at one university relating to "Patient safety: numerical skills and drug calculation abilities of nursing students and Registered Nurses", reported that 55% (126/229) of the students and 45% (20/44) of Registered Nurses failed the numeracy test, and 92% (211/229) of the students and 89% (39/44) of RNs failed the drug (medication) calculation test. With the lack of KAP surveys on UFH administration, published studies on the pharmacology of UFH are presented.

2.6 Pharmacology of UFH

"Heparin is a natural anticoagulant found in mammals" (Pittard, 2001:73); it is present in the liver, lungs, mast cells and intestinal mucosa of bovine and porcine mammals (Pittard, 2001:73; Davenport, 2009:456). UFH is composed of glycosaminoglycans with molecular weights ranging from 3000 to 30 000 Daltons (Sonawane, Kasbekar & Berns, 2006:305; Winkler, Sheppard & Fantz, 2007:499; Fischer, 2007:181). However, an important feature of UFH is that heparin itself is not an anticoagulant, but when injected into the bloodstream heparin inhibits the clotting cascade of events (Fischer, 2007:181). Heparin combines with heparin cofactor anti-thrombin III, and this complex prolongs the time it takes the patients' blood to clot (Pittard, 2001:74; Wimberley & Wiggins, 2004:47; Fischer, 2007:181).

Research by Winkler et al. (2007:499) reports that determining the efficacy of heparin is by its bioavailability through its route of administration. The half-life of UFH is 30-120 minutes (Hertel cited by Latham, 2006:548), and it takes seven half-lives to remove over 99% of a single intravenous heparin injection (Pittard, 2001:74). Even though about 35% of UFH is excreted by normal kidneys, in patients on chronic haemodialysis the excess heparin is not excreted, meaning that heparin is not dialysable (Pittard, 2001:75) and remains in the blood circulation.

Tahir (2007:28) confirms that in renal and hepatic dysfunction, the half-life of UFH is prolonged and the rate of clearance of UFH is decreased. Therefore, it is important for nurses (renal unit practitioners) to be knowledgeable regarding the pharmacological aspects of medication such as UFH to minimise patient harm (and the safety of adult chronic haemodialysis patients) (Schull, 2006:xv).

2.7 Dosage of UFH

Pittard (2001:75) proposes that the dose of UFH should be based on body weight and/or clotting studies, since patients with chronic kidney disease (CKD) and patients with uraemia will require less heparin (Pittard, 2001:75). Furthermore, it is stated that individual patients have a different rate of metabolising the prescribed

UFH (Davenport, 2009:456). In addition, performing baseline-clotting studies for new patients assists in determining their individual dose of UFH (Pittard, 2001:75). Other researchers (Winkler et al., 2007:499) also support the need for strict laboratory monitoring of UFH to establish therapeutic doses for patients and prevent under- or over-anticoagulation.

Nevertheless, the renal guidelines and certain authors endorse standardised heparin dosing for all patients instead of individualised doses. In South Africa, the SARS chronic guideline recommends a loading dose of 50 IU/kg followed by 800–1500 IU per hour. On the other hand, the European Best Practice Guidelines (EBPG) recommend 50 IU/kg initial dose, followed by 500-1500 IU of UFH per hour given continuously via arterial access needle (EBPG, 2002). Researchers Brunet et al. (2008:789) support using UFH 50 IU/kg for a 4-hour haemodialysis session by dividing the UFH dose into a 25 IU/kg bolus on commencing haemodialysis and 25 IU/kg for the remainder of the haemodialysis session. The recommendation from Baglin et al. (2006:27) is a bolus of UFH followed by continuous infusion of 250–1000 IU/hour until the procedure is completed.

Ouseph and Ward (2000:181) argue that there is no uniformity, resulting in the usage of multiple strategies for UFH dosing, and this can result in inadequate or excessive anticoagulation in many patients. In addition, some (Winkler et al., 2007:499) are of the opinion that laboratory monitoring for UFH dose will provide an opportunity to improve patient safety. However, Tahir and others (2007:28) propose using a weight-based nomogram for patient heparinisation regimes, as they feel that there is a relationship between dose of UFH administered and its safety and efficacy.

The abovementioned UFH dosing regimens suggest that there are different variations and no consensus – hence the importance of re-examining practices regarding UFH. UFH protocols of the participating Cape Town Metropole dialysis centres reveal that the majority of renal unit practitioners in the haemodialysis centres administer a prescribed standard dose of 5000 IU of heparin three times a week to patients during the haemodialysis sessions. Therefore, calculating a

patient's yearly dose of UFH means a single dialysis patient receives approximately 780 000 IU per year, thus predisposing the patient to long-term effects of UFH. The potential adverse effects of this enormous yearly UFH dose that a patient receives should be a concern for renal unit practitioners. A calculated guess is that renal unit practitioners probably do not think of patients' yearly exposure to UFH because their focus is on the current dialysis session dose.

2.8 Monitoring effects of UFH

There is consensus (Pittard, 2001:75; Niccolai et al., 2004:146S; Schull, 2006:523) that the following parameters need monitoring in a patient receiving UFH to enhance patient safety: clotting times, haemoglobin/haematocrit, activated partial thromboplastin time (aPTT), platelet count, serum potassium, stool guaiac and urinalysis. There is a risk of bleeding in 1.5% to 20% of patients (Tahir 2007:29) post-infusion with UFH. Dahlman (1993) and Warkentin and Barkin (1999), (cited by Tahir, 2007:29) reported that the bleeding risk associated with UFH therapy is enhanced when the conditions listed in Table 2.3 are present. Consequently, renal unit practitioners must be vigilant when administering and monitoring patients receiving UFH.

Table 2.3: Bleeding risk during UFH therapy

Use of other antithrombotic therapy
Concurrent anti-platelet drug or non-steroidal anti-inflammatory drug use
Pre-existing source of bleeding
Liver disease
History of recent surgery or trauma
Peptic ulcers
Malignancy
Age older than 65 years
Falls

Adapted from Tahir (2007)

Other studies (Pittard, 2001:75; Furuhashi et al., 2002:1457) also verify the importance of monitoring the effects of UFH during haemodialysis by conducting

coagulation studies, because UFH can be associated with a number of potentially serious adverse effects after administration. Their perspective was that the adverse effects are not limited to and include haemorrhage, heparin-induced thrombocytopenia (HIT) and osteoporosis (Pittard, 2001:75; Furuhashi et al., 2002:1457).

HIT, although a rare, severe adverse effect of UFH administration, nevertheless has an impact on morbidity and mortality of patients (Szromba, 2010:185). As a result, it is important to monitor patients closely during administration of UFH in order to be alert to and detect the signs of HIT early, for example a low platelet count, and conduct the necessary investigations to rule out the presence of HIT.

Additional concerns (Bircher et al., 2006:1433) are that immediate hypersensitivity reactions such as; bronchospasm, urticaria and facial oedema caused by heparin following administration, are rarely reported. This includes the potential problem of hyperkalaemia (Cronin & Reilly, 2010:512), which can be life threatening, especially if patients do not comply with dietary restrictions and treatment. Research confirms that when using UFH for catheter thrombosis prophylaxis it can have systemic effects and be associated with excessive bleeding (Sonawane et al., 2006:306).

Suranyi and Chow agree that it is important to know that there is risk attached to haemodialysis heparinisation, such as accidentally overfilling when locking tunnelled catheters (Suranyi & Chow, 2010:387), therefore renal unit practitioners should be cautious when locking tunnelled catheters post-dialysis. Colvin and Barrowcliffe (1993:99) confirm that there must be awareness regarding relative contraindications to administering UFH. Table 2.4 presents contraindications to heparin therapy.

Table 2.4: Contraindications to UFH therapy

General contraindications
Active bleeding
Haemophilia or other haemorrhagic tendencies
Cerebral haemorrhage
Uncontrolled hypertension
Hepatic dysfunction including oesophageal varices
Peptic ulceration
Known hypersensitivity to heparin

Adapted from Colvin & Barrowcliffe (1993)

In 2008, the US Centres for Disease Control (CDC) and Prevention conducted a nationwide investigation of UFH following reports of severe adverse reactions experienced in a single haemodialysis centre. The finding was that heparin contaminated with oversulfated chondroitin sulfate (OSCS) resulted in the death of some patients (CDC, 2008). In the June 2011 issue of the Nephrology News and Issues journal, it reported that "Baxter loses first contaminated heparin lawsuit". The article stated that a man who was administered the allegedly contaminated heparin manufactured in China and sold by Baxter Healthcare Corporation was awarded $625 000 to his estate ("Baxter loses first contaminated heparin lawsuit", 2011). This companys' financial loss highlights a potential risk for failing to ensure safety aspects for drugs used are maintained.

Table 2.5 displays a summary of the most frequently reported drug products with errors due to improper dosage or quantity in a report of Hicks, Cousins and Williams (2003) regarding.

Table 2.5: Most frequently reported medication error information (2002)

Error category	Product	No. (%) of errors
All error categories (n=44,593)	UFH	1275 (2.9)
	Insulin	1220 (2.7)
	Morphine	959 (2.2)
Most harmful types of errors (n=856)	UFH	81 (9.5)
	Morphine	79 (9.2)
	Insulin	65 (7.6)

Adapted from Hicks, Cousins and Williams (2003)

The data in Table 2.5 indicate that of all error categories (n=44,593), UFH (n=1275) represents the highest percentage (2.9%), and that of the most harmful types of errors (n=856), UFH (n=81) is also involved in the highest percentage (9.5%).

2.9 Summary

Included in this chapter was a literature review of methods, maintaining quality assurance of KAP cross-sectional studies and Benner's conceptual framework. A review of published literature on general medication studies, medication adverse effects studies as well as medication KAP studies was undertaken. Due to the paucity of local published literature on UFH studies, this chapter highlighted the international published evidence regarding UFH pharmacology, dosage and monitoring.

CHAPTER 3: METHODOLOGY

3.1 Introduction

This chapter discusses the research methodology employed to survey renal unit practitioners' knowledge (K), attitude (A) and practice (P) relative to the use and effects of UFH. A self-administered KAP questionnaire was used for the survey to ensure that there was no manipulation of information gathered, as each respondent gave their perspective regarding unfractionated heparin.

Description includes the research design, research setting, study population, sample size, instrumentation (design, validation and reliability testing), data collection method, data management and statistical analysis methods. A description of the ethical aspects considered for this study concludes this chapter.

3.2 Research design

To address the research questions a descriptive cross-sectional design of a KAP survey was employed, using a self-administered questionnaire. The descriptive survey method (Polit & Beck, 2004:192) aims "to describe and document aspects of a situation as it naturally occurs".

3.3 Population

The study population is composed of Registered and Enrolled Nurses and Clinical Technologists (Nephrology) working in two tertiary hospital adult chronic haemodialysis centres and in five adult chronic haemodialysis centres of one private dialysis service provider in the Cape Town Metropole.

3.3.1 Inclusion criteria

3.3.1.1 Professional categories

The following participants from the above population were included in the study.

- Certified Registered Nurses who had completed any of the following training programmes:
  - A Postgraduate Diploma in Nephrology Nursing (minimum 1 year)
  - A Renal Certificate (6 months)
  - A Diploma in Critical Care (1 year)
  - Critical Care Certificate (6 months).
- Registered Nurses studying for an additional qualification in any of the specialist areas above during the study period February to December 2013, and working in the research settings.
- Registered Nurses without the additional qualifications as listed above, working in the selected research settings.
- Certified Clinical Technologists who had a Diploma in Nephrology Clinical Technology (3 years) or a Bachelor's Technical Degree in Nephrology Clinical Technology (4 years), including students on these programmes working in the selected research settings.
- Enrolled Nurses working in the selected research settings.

3.3.1.2 Personal categories

Renal unit practitioners of any gender, age and citizenship meeting the above professional category requirements were included.

3.3.1.3 Location of the hospitals and dialysis centres

The hospitals and private dialysis centres were within the geographical borders of the Cape Town Metropole.

3.3.2 Exclusion criteria

Excluded from the study were those renal unit practitioners who participated in pilot testing the questionnaire.

3.3.3 Sample size

To estimate sample size in the absence of published data, personal clinical experience indicated that at least 50% (n=52) of the population (N=104) would

have a satisfactory level of knowledge concerning the use and effects of UFH in a chronic dialysis unit. The following information entered into StatCalc of EpiInfo version 7 was:

- Population size = 104 renal unit practitioners
- Incidence of satisfactory KAP n= 52; 50%
- Margin of error = 1.0%
- Confidence Interval (CI) = 95%

It was estimated that a sample size of 82 was needed. The assumption is that the participating practitioners would have specialist knowledge, skills and a confident, informed attitude concerning the use and effects of the high-alert medication UFH.

3.3.4 Sampling method

The study employed a non-probability convenience sampling method. Due to the small numbers, all renal unit practitioners meeting the inclusion criteria were asked to volunteer, to accommodate for the potential loss of non-participatory respondents and to enhance the reliability and validity of the study. Despite the potential for bias, this was an appropriate sampling method for the following reasons:

- Some dialysis centres do not employ all the categories of renal unit practitioners needed for inclusion in the study. Therefore to ensure that this criterion was met, a purposive sampling of centres was done.
- All categories of renal unit practitioners ought to be present during the sampling period; therefore each category has the potential to be included in the study.

Limitations of the non-probability convenience sampling include difficulty in extrapolating the findings to other South African renal unit practitioners' performance.

3.3.5 Recruitment

Recruitment occurred in purposively selected adult chronic haemodialysis facilities in the Cape Town Metropole, namely two tertiary government hospitals and five dialysis centres of one private dialysis service provider. Anonymity and confidentiality were protected by using a randomly assigned number to each hospital and privately owned dialysis centre participating in the study. Consistency was maintained by using the assigned number for each institution throughout the study when referenced (Table 3.1).

Table 3.1: Dialysis centres included in the study

Information categories		**Dialysis institutions**					
Number of dialysis units included in study: n = 7	**Dialysis centre 1**	**Dialysis centre 2**	**Dialysis centre 3**	**Dialysis centre 4**	**Dialysis centre 5**	**Dialysis centre 6**	**Dialysis centre 7**
Administration body	Public	Public	Private	Private	Private	Private	Private
Number of dialysis units	1	1	1	1	1	1	1
Classification	Tertiary	Tertiary	N/A	N/A	N/A	N/A	N/A
Registered Nurses	8 (38.1%)	17 (58.6%)	8 (66.7%)	10 (76.9%)	14 (73.7%)	4 (100%)	5 (83.3%)
Enrolled Nurses	5 (23.8%)	5 (17.2%)	1 (8.3%)	1 (7.7%)	2 (10.5%)	0	1 (16.7%)
Clinical Technologists	8 (38.1%)	7 (24.1%)	3 (25%)	2 (15.4%)	3 (15.8%)	0	0
Total number of permanent renal unit practitioners (N = 104)	21	29	12	13	19	4	6

Furthermore, to uphold renal unit practitioners' confidentiality, anonymity and a non-biased response, the researcher did not have direct access to them. The means of communication with renal unit practitioners was through the Unit Managers of the purposively selected dialysis centres, after obtaining written permission from the relevant tertiary hospitals' Medical Superintendents, Nursing Managers and the Renal Unit Medical Heads of the department and the private dialysis provider management.

On completion of the sampling procedure, data collection followed as planned.

3.4 Data collection

Data collection describes the appropriate development of instruments or tools used to collect data to inform the study, based on the research design and methodology (Delport & Roestenburg, 2011:171).

Polit and Hungler (1993:20) affirm that this phase can be very challenging, because if no high-quality and accurate data collection tools are developed, this can compromise the robustness of the study.

3.4.1 Design of data collection tool

Design of the self-administered survey questionnaire cannot be separated from content validity so at this stage these processes will be described concurrently. First, content validity was determined using the Index of Content Validity (CVI) approach described in the classic article by Lynn (1986). “A review of the ISI Citation Index reveals 186 citations of the Lynn reference in the disciplines of nursing, medicine, sociology, psychology, pharmacology, physical therapy, occupational therapy, social work, and education” (Schilling et al., 2007:362). Lynn defined content validity as “the determination of the content representativeness or content relevance of the elements/items of an instrument by the application of a two-stage (development or judgment) process” (1986:382). Lynn described the process by which content validity should be determined and a method to quantify it.

There were three steps in the development stage of determining content validity: domain identification (knowledge, attitude and practice), item generation (personal experience and a review of the published literature), and instrument formation (development of the survey questionnaire and deciding on a suitable sequence of the items). The structured questionnaire consisted of fixed, closed questions (pre-coded response choices) for easy to count answers for quantitative data and analysis (Bowling & Ebrahim, 2007:405), comprehensive enough to prevent responses being forced into inappropriate categories and open-ended questions.

Open-ended questions were included to minimize successful guessing (Bowling & Ebrahim, 2007:405).

The information used to design a self-administered questionnaire (Appendix 1) was based on the aims and objectives of the study, personal experience, applicable available published literature (Agency for Healthcare Research and Quality (n.d.), Institute for Safe Medication Practices (2006, 2007), National Patient Safety Agency (2006) World Health Organisation (2008) and published journal articles on UFH to ensure content validity. Presented in Table 3.2 is a description of the design of the questionnaire and the sources for the development of the questions.

Table 3.2: Design of questionnaire and source for questions

Section	Information	Question design and source
Section A	Personal information	Q001: Age, Q002: Gender, Q003: Citizen (WHO, 2008)
Section B	Professional profile	Q004: Professional Category, Q005: Qualifications, Q006: Experience, Q007: Orientation mentor, Q008: Duration of Orientation programme, Q009: In-service education (Researcher-designed)
Section C	Knowledge regarding UFH	Q010: Bleeding Tendencies (Pittard, 2001) Q011: UFH effect on clots (Pittard, 2001) Q012: UFH effects (Pittard, 2001) Q013: UFH administration when blood pressure elevated (Lankshear, Harden & Simms, 2010) Q014: UFH effects on platelets (AHRQ, 2006; Baglin et.al., 2006; Lankshear et al., 2010) Q015: Protamine sulphate dose to arrest bleeding (European Best Practice Guidelines Expert Group on Haemodialysis, 2002; Baglin et al., 2006) Q016: UFH oral delivery (Lee et al., 2001) Q017: Importance of baseline urea value (Pittard, 2001) Q018: UFH delivery method (De Vos et al., 2000; SARS, 2006) Q019: Type of UFH (Shen & Winkelmayer, 2012) Q020: UFH temperature storage (Bodene, 2008) Q021: UFH effects on potassium (Lankshear et al., 2010; AHRQ, 2011) Q022: UFH dose calculation (researcher-designed)
Section D	Attitude regarding UFH	Q023: UFH adverse effects (Wimberley & Wiggins, 2004) Q024: UFH and attitude (Researcher-designed, Niccolai et al., 2004; ISMP, 2007, Chevalier et al., 2011) Q025: Patient information re UFH (ISMP, 2007) Q026: Patient information re UFH adverse effects (ISMP, 2007)
Section E	Practice regarding UFH	Q027: Prescription UFH (Researcher-designed) Q028: Checking new patient coagulation results (Pittard, 2001) Q029: Checking current patient coagulation results (Researcher-designed) Q030: Review UFH literature (Researcher-designed) Q031: Concerns regarding UFH (ISMP, 2007) Q032: Adjusting UFH dose (Researcher-designed) Q033: Witness UFH reaction (Researcher-designed) Q034: Consult for UFH information (Sulosaari, Suhonen & Leino-Kilpi, 2010) Q035: UFH practice-related (Schull, 2006; ISMP, 2007)

An outline of the study objectives and related questions by type are presented in Table 3.3.

Table 3.3: An outline of study objectives and related questions by type

Objective	Section	Question(s)	Types of questions
1.7.2 To describe the demographic and professional profiles of respondents and to determine differences between the groups	A, B	1 to 9	Q001: Age – open-ended – number Q002: Gender -closed-ended – category Q003: Citizen – closed-ended – category Q004: Professional category – closed-ended – category Q005: Qualifications – closed-ended category Q006: Experience –- open-ended –- number Q007: Orientation mentor –- closed-ended – category Q008: Duration of orientation programme – category Q009: In-service education –- closed-ended – category
1.7.1.1 To describe respondents' self-reported knowledge of UFH	C	10 to 22	Q010: Bleeding tendencies – closed-ended –- category Q011: UFH effect on clots -closed-ended – category Q012: UFH effects – closed-ended - category Q013: UFH administration when blood pressure elevated – closed-ended – category Q014: UFH effects on platelets – closed-ended – category Q015: Protamine sulphate dose to arrest bleeding – closed-ended – category Q016: UFH oral delivery – open-ended Q017: Importance of baseline urea value – open-ended Q018: UFH delivery method – open-ended Q019: Type of UFH – open-ended Q020: UFH temperature storage – open-ended Q021: UFH effects on potassium – open-ended Q022: UFH dose calculation – open-ended
1.7.3.1 To determine whether there is an association between selected variables and knowledge concerning the use and effects of UFH	A, B, C	1 to 9 10 to 22 relative to knowledge	
1.7.1.2 To describe respondents' self-reported attitude regarding the use and effects of UFH	D	23 to 26	Q023: UFH adverse effects – closed-ended – rating Q024: UFH and attitude – closed-ended – rating Q025: Patient information re UFH –- closed-ended – rating Q026: Patient information re UFH adverse effects –- closed-ended – rating

Objective	Section	Question(s)	Types of questions
1.7.3.2 To determine whether there is an association between selected variables and attitude concerning the use and effects of UFH	A, B, D	1 to 9 23 to 26 relative to attitude	
1.7.1.3 To describe respondents' self-reported practice regarding UFH	E	27 to 35	Q027: Prescription UFH – closed-ended – rating Q028: Checking new patient coagulation results – closed-ended – rating Q029: Checking current patient coagulation results –- closed-ended – rank Q030: Review UFH literature –- closed-ended – multiple choice Q031: Concerns regarding UFH – closed-ended – category Q032: Adjusting UFH dose – closed-ended – multiple choice Q033: Witness UFH reaction – closed-ended –- multiple choice Q034: Consult for UFH information – closed-ended – rating Q035: UFH practice-related – closed-ended –- rating
1.7.3.3 To determine whether there is an association between selected variables and practice concerning the use and effects of UFH	A, B, E	1 to 9 27 to 35 relative to practice	

Legend: Q = Question

3.4.1.1 Questions for measuring knowledge

Section C of the questionnaire (Appendix 1) comprised 13 questions to measure knowledge of UFH that renal unit practitioners are presumed to have. Six questions were closed-ended and seven questions were open-ended. The intention with the open-ended questions was to give respondents the opportunity to use their own words (Bowling & Ebrahim, 2007:394), to test higher cognitive levels such as comprehension and application than merely recall from closed-ended questions and to minimize successful guessing (Bowling & Ebrahim, 2007:405).

3.4.1.2 Attitude-measuring questions

Section D of the questionnaire (Appendix 1) was composed of four questions with one question (024) subdivided into six statements, for which there was a 5-point Likert attitude scale to illicit responses ranging from "Strongly Agree" to "Strongly Disagree". Likert scales in use vary from two points up to eleven or more but "the reason why five has become the norm is probably because it strikes a compromise between the conflicting goals of offering enough choice (since only two or three options means measuring only direction rather than also strength of opinion) and making things manageable for respondents (since few people will have a clear idea of the difference between, say, the eighth and ninth point on an eleven-point agree-disagree scale). Research confirms that data from Likert items (and those with similar rating scales) becomes significantly less accurate when the number of scale points drops below five or above seven. However, these studies provide no grounds for preferring five rather than seven-point scales" (Johns, 2010:6). All the statements for this question (024) were positively worded. The remaining three questions consisted of a numerical rating scale. One question required ranking and the other two were closed-ended. Some of the attitude-measuring statements began with a guiding statement, "I feel….." to encourage respondents to verbalise feelings about a particular situation.

3.4.1.3 Practice behaviour-measuring questions

Section E of the questionnaire (Appendix 1) focused on the respondents' practice behaviour. It consisted of nine questions with one question subdivided into six statements. A few of the questions required ranked responses. The design of one question (035) was subdivided into six statements and had a four point response

scale for frequency of practice (Always, Usually, Sometimes, Never). Some questions were closed questions and four were open-ended.

After construction of the eight-page self-administered questionnaire, it was distributed to experts for validation (see below). Missing data would be assigned a number of '1001' and not be taken into account when computing the results as missing data can reduce the overall interpretation of the results. Thereafter it was pilot tested for reliability to verify consistency (Delport & Roestenburg, 2011:177). This ensured that the self-administered questionnaire measured what it was supposed to measure (validity), thereby producing the same or similar results every time it was administered to respondents under similar conditions (Delport & Roestenburg, 2011:178).

3.4.2 Validity

The judgement-quantification stage involved recruiting three experts (acceptable minimum number) (Lynn, 1986) in the content/domain areas of the survey questionnaire who were given a checklist (Appendix 3) with a scale for quantifying the content validity.

3.4.2.1 Procedure for establishing content validity of the questionnaire

Three experts in the clinical field, namely a Nephrologist, a Research Pharmacist and a qualified Nephrology Nurse, reviewed the questionnaire for content validity. Quantification of content validity was achieved by using the index of content validity (CVI) as outlined by Lynn (1986) and adapted from Kyriacos' (2011) study with permission. The CVI was derived from rating the content relevance (Appendix 3) of each questionnaire item using a 4-point ordinal rating scale. A rating of 1 was perceived as irrelevant and a rating of 4 as extremely relevant (Lynn, 1986). Validity was predetermined and set at the proportion of items that received a rating of 3 or 4. Comments and/or omissions were listed separately.

These experts were provided with the final draft of the questionnaire (Appendix 1) and a covering letter with the CVI instrument (Appendix 3), with instructions on how to evaluate the questionnaire. The CVI instrument ensured a uniform

approach by experts for validation of the questionnaire. Thereafter, relevant changes were made.

- Validation results for Index of Content Validity (CVI) of the questionnaire
  The expert reviewers returned their completed CVI questionnaire within two weeks of receiving the questionnaire. Data in Table 3.4 show the analysis of three experts' opinions on the index of content validity (CVI) of each question on the questionnaire.

Table 3.4: Experts' index of content validity (CVI) of each question

Question number	1 = irrelevant	2 = unable to assess relevance without item revision or item is in need of such revision that it would no longer be relevant	3 = relevant but needs minor alteration	4 = extremely relevant
001		1 (33.3%)		2 (66.6%)
002				3 (100.0%)
003			1 (33.3%)	2 (66.6%)
004			1 (33.3%)	2 (66.6%)
005			1 (33.3%)	2 (66.6%)
006			1 (33.3%)	2 (66.6%)
007				3 (100.0%)
008			1 (33.3%)	2 (66.6%)
009				3 (100.0%)
010			2 (66.6%)	1 (33.3%)
011				3 (100.0%)
012				3 (100.0%)
013				3 (100.0%)
014	1 (33.3%)		1 (33.3%)	1 (33.3%)
015				3 (100.0%)
016			1 (33.3%)	2 (66.6%)
017			1 (33.3%)	2 (66.6%)
018			2 (66.6%)	1(33.3%)
019	1 (33.3%)			2 (66.6%)
020			1 (33.3%)	2 (66.6%)
021			1 (33.3%)	2 (66.6%)
022			1 (33.3%)	2 (66.6%)
023		2 (66.6%)	1 (33.3%)	
024a			1 (33.3%)	2 (66.6%)
024b				3 (100.0%)
024c				3 (100.0%)
024d				3 (100.0%)
024e			1 (33.3%)	2 (66.6%)
024f				3 (100.0%)
025			1 (33.3%)	2 (66.6%)
026			1 (33.3%)	2 (66.6%)
027			1 (33.3%)	2 (66.6%)
028				3 (100.0%)
029				3 (100.0%)
030			1 (33.3%)	2 (66.6%)
031				3 (100.0%)
032			1 (33.3%)	2 (66.6%)
033			1 (33.3%)	2 (66.6%)
034				3 (100.0%)
035a				3 (100.0%)
035b			2 (66.6%)	1 (33.3%)
035c			1 (33.3%)	2 (66.6%)
035d				3 (100.0%)
035e			1 (33.3%)	2 (66.6%)
035f				3 (100.0%)

Overall, the experts' evaluation of the questionnaire was positive as most of their responses (44/45, 97.8%) as to the importance of the questions fell in the "extremely relevant" (4) box (Table 3.4). Eighteen of the 44 questions (40.9%)

were rated a 4 by the three (100%) experts. Twenty-two of 44 questions (50.0%) were rated a 4 by two (66,6%) experts. The remaining 4 of 44 questions (9.1%) were rated a 4 by one (33.3%) expert.

Data show that 25/45 (55.6%) items were rated 3 (relevant but needs minor alteration). Of these, 22 of 25 questions (88.0%) were rated a 3 by one (33.3%) expert and 3 of 25 questions (12.0%) were rated a 3 by two (66.6%) experts; and 2/45 (4.4%) were rated 2 (unable to assess relevance without item revision or item is in need of such revision that it would no longer be relevant). Of this rating, there was 1 of 2 questions that was rated a 2 by one (33.3%) expert. The other question rated a 2 was by two (66.6%) experts. The rating of 1 (irrelevant) was applicable to 2/45 (4.4%) questions. Both questions had one expert rating the question as 1.

As recommended by the experts, the following questions were modified: Q003 was changed to include the words "how long working in South Africa"; and the instruction "complete the following questions below in your own words" was added to Q006 and 016 – 022. To achieve clarity, questions 014, 018, 019 and 023 were re-formulated. Questions 024a, 024e, 025, 033, 035e and 035f words of “side-effects” were changed to “adverse effects” to achieve consistency with wording.

One of the two questions rated 2 related to age in Section A Q001 which was not considered important by one expert reviewer. No change was made to this question, as it would provide useful information about the respondents’ demographic characteristics in relation to the objectives of the study. The second question was in Section D, Q023 (Table 3.5), where two reviewers felt the question design was confusing and therefore could not answer the question. Q023 was amended by removing the Likert scale answer key and replacing with a linear response scale key.

Table 3.5: Amendment to Question 023, Section D

Original Question 023	Amended Question 023
Patients on haemodialysis receiving UFH may experience side effects. On a scale of 5 to 1 how would you rank the side effects for patients receiving UFH (where 5 indicate great concern and 1 indicates the least concern]?	Patients on haemodialysis receiving UFH may experience adverse effects. On a scale of 5 to 1 make a **mark** to show how you would rank your concerns about these adverse effects [for patients receiving UFH - **5** indicates great concern and 1 indicates the least concern]
[ ] Neutral [ ] Extremely concerned [ ] Fairly concerned [ ] Highly concerned [ ] Least concerned	1 2 3 4 5 Least concern Great concern

The ratings of two questions were 1, and both were in the knowledge section C. Q014 related to "For which platelet count would UFH not be administered?". The fact that the reviewer was "Not sure" did not mean the question was not relevant, as this is an important knowledge question. A minor change was made, as follows: "Which of the following platelet counts would you not administer UFH?" For the other question, Q019 "What type of UFH is used in your dialysis unit", the reviewer did not substantiate a score of 1. No change was made as the question is a relevant knowledge question. Since this was the opinion of only one reviewer, the two questions were slightly adjusted and not discarded.

After the amendments were made, the questionnaire was taken as having achieved content validity.

3.4.2.2 Procedure for establishing face validity of the questionnaire

For determining face validity of the questionnaire (layout, format, quality of printing, length, if visually easy to read and comprehend and if instructions at the beginning of the questionnaire were clear and easy to understand) (Bowling & Ebrahim, 2007:404), a further section was added to the checklist (Appendix 3) with four criteria (very skilful, satisfactory, needs improvement, unacceptable) but no rating scale. The same three experts who determined the CVI of the questionnaire also determined its face validity.

- Validation results for face validity of the questionnaire

Data analysis for reviewers' evaluation of face validity of the questions is presented in Table 3.6.

Table 3.6: Evaluation of face validity of the questionnaire

	Very skilful	Satisfactory	Needs improvement	Unacceptable
Layout	1 (33.3%)	2 (66.7%)		
Format		3 (100%)		
Quality of printing	3 (100%)			
Length of the questionnaire	3 (100%)			
Visually easy to read	3 (100%)			
Visually easy to comprehend		3 (100%)		
Are instructions at the beginning of the questionnaire clear and easy to understand	3 (100%)			

(Adapted from Bowling and Ebrahim, 2007).

Concerning the experts' evaluation of the face validity of the questionnaire, most responses (5/7, 71.4%) indicated that the quality of printing, length, visual presentation (easy to read and understand) and clear instructions had been 'very skilfully' executed (Table 3.6). The remaining two criteria were satisfactory (layout and format). Their suggestions were accepted and changes were made to the layout of the final questionnaire: use of an appropriate font size and symmetrical spacing of paragraphs to ensure a professional appearance of the questionnaire. A suggestion of putting the numbers in answer boxes in 'shadow' outline was accepted, and these changes were implemented. Ambiguous questions in the questionnaire were refined, namely Section C, Q014, Q018 and Q019 and Section D, Q023. Lastly, the suggestion to group closed-ended questions and open-ended questions was accepted and changes made. The reviewers noted no omissions.

Following content and face validation, the data instrument was pilot tested for reliability by a pilot group.

3.4.3 Reliability testing

For this purpose the Pearson's r correlation co-efficiency test (for inter-rater reliability) for correlation analysis and Cronbach's Alpha co-efficiency test (for

internal consistency) for reliability analysis was used. This was to determine whether the difference between the two scores (test 1 and test 2) for each respondent across the KAP questionnaire was statistically significant and to assess the score reliability.

The pilot group comprised renal unit practitioners who would not participate in the main study. This group assisted in reliability testing of the self-administered questionnaire. Testing for reliability is important because the data instrument must yield the same results when the same variable is tested each time that the instrument is used, thus ensuring that the instrument is consistent, dependable and predictable (Delport & Roestenburg, 2011:177). This study used inter-rater and internal consistency reliability methods to estimate the reliability of the instrument (questionnaire) for use in the main study (Trochim, 2006:96).

3.4.3.1 Pilot study

The pilot study was a small scale preliminary attempt to improve upon the self-administered questionnaire prior to performance of the full-scale study. This provided the researcher with an opportunity to review aspects relating to the interpretation of the questionnaire, whether instructions were clear, and the time it took to complete (Delport & Roestenburg, 2011:195).

To determine the acceptable time interval between the test-retest reliability method, the researcher reviewed results from previous research to make an informed decision. The Medical Research Council (MRC) in the United Kingdom (2013) discussed three examples of acceptable time intervals for administering test-retest self-administered questionnaires. In 2000 Patterson (cited by the MRC, 2013) reported 1–3 days but no more than 7 days for physical activity self-reports, and 4–8 weeks for a dietary assessment, to reduce the chance of the first assessment influencing the second. For a short time frame (1–7 days) the report says it was difficult to observe significant differences, but this could be possible with a longer interval between tests.

Nonetheless, Trochim (2006:97) acknowledges that the time interval between the two tests is critical and influences correlation error, thereby affecting reliability.

However, the study by Marx et al. (2003:730) confirmed that two different time intervals between test-retest for reliability yielded no statistically significant differences when carried out at 2 days or 2 weeks. Due to the different viewpoints, an informed decision was made to grant an allowance of one week between the delivery and return of both self-administered questionnaires to pilot study personnel.

3.4.3.2 Pilot study personnel

The pilot study group was not part of the main study and comprised one Registered Nurse (RN), one Enrolled Nurse (EN) and One Clinical Technologist (CT, Nephrology). They were from the same professional categories as the main study to authenticate the reliability of the instrument (self-administered questionnaire) (Karanicolas et al., 2009:99). Similar to the main study professional category, they were responsible for administration of UFH in dialysis centres, except that the location was in KwaZulu-Natal Province. The researcher telephonically informed the pilot study group of the study and requested their voluntary participation, and all three pilot study personnel agreed to participate. The researcher requested them to answer honestly and to maintain the questionnaire's confidentiality.

The self-administered questionnaire (Appendix 1) for the first test was emailed to the pilot study personnel for them to complete. They returned the completed self-administered questionnaires via email within the allocated timeframe of one week. Then the same (blank) self-administered questionnaire was emailed to the same pilot study personnel for the retest. They completed and returned by email within the one-week time period. The pilot study personnel confirmed that 30–60 minutes was required to complete the questionnaire. They expressed difficulty in answering some questions due to their limited knowledge of UFH.

Thereafter, the pilot study raw data were captured on a Microsoft® Excel spreadsheet and analysed for consistency of responses between test 1 and test 2. The answer sheet to the questionnaire (Appendix 11) guided the scoring of the two test responses. The knowledge items were allocated a score of 18 marks,

attitude items were allocated a score of 41, and practice items a score of 50. Missing responses in both test 1 and test 2 were regarded as incorrect and a zero score was allocated. To measure the percentage of agreement of the results between test 1 and test 2 an inter-rater reliability estimate was conducted (Trochim, 2006:96) including an internal consistency to measure the consistency of results across items within a test.

It is desirable when measuring reliability that more than one statistical estimate should be considered to determine the relationship between measurement errors (Karanicolas et al., 2009:103) to test the stability, equivalence and homogeneity of the instrument (Burns & Grove, 2011:333). Using the SPSS statistical program the researcher performed the Pearson's *r* correlation co-efficiency test (for inter-rater reliability) in correlation analysis and Cronbach's Alpha co-efficiency test (for internal consistency) in reliability analysis. This was to determine whether the difference between the two scores (test 1 and test 2) of each respondent across the KAP questionnaire was statistically significant, and to assess the score reliability.

A point worth noting is that there will always be a degree of uncertainty when using humans as control measures, because the results they yield may not be consistent or reliable due to distracters (Trochim, 2006:96), and a change in value or score may be a consequence of a random or systematic error (Burns & Grove, 2011:333). Moreover, there is no absolute value at which inter-rater reliability is unacceptable; however, values below 0.80 should be of concern regarding the reliability of the tool (Burns & Grove, 2011:333). Polit et al. (1993:284) consider reliability coefficients of 0.70 upwards as acceptable, but measurements of 0.85 – 0.95 were preferred.

Results for inter-rater reliability and internal consistency of scores for the RN, CT and EN in the pilot study are shown in Table 3.7.

Table 3.7: Pilot study inter-rater and internal consistency reliability test scores

Questionnaire subsection (Question)	RN		CT		EN	
	Test 1 score (%)	Test 2 score (%)	Test 1 score (%)	Test 2 score (%)	Test 1 score (%)	Test 2 score (%)
Knowledge (10-22) out of 18 marks	13 (72.2)	13 (72.2)	11 (61.1)	9 (50.0)	9 (50.0)	7 (38.8)
Inter-rater results using Pearson's *r*	0.982 (*p*=0.121) Test 1 M=11.0; SD±2.0 Test 2 M=9.7; SD±3.1					
Internal Consistency results using Cronbach's alpha	0.947 Test 1 M=11.0; SD±2.0 Test 2 M=9.7; SD±3.1					
Attitude (23-26) out of 41 marks	27 (65.8)	27 (65.8)	29 (70.7)	31 (75.6)	22 (53.6)	22 (53.6)
Inter-rater results using Pearson's *r*	0.939 (*p*=0.224) Test 1 M=31.3; SD±5.9 Test 2 M=31.0; SD±4.0					
Internal Consistency results using Cronbach's alpha	0.933 Test 1 M=31.3; SD±5.9 Test 2 M=31.0; SD±4.0					
Practice (27-35) out of 50 marks	39 (70.7)	39 (70.7)	38 (76.0)	35 (70.0)	40 (80.0)	41 (82.0)
Inter-rater results using Pearson's *r*	1.000 (*p*=0.016) Test 1 M=23.7; SD±15.6 Test 2 M=23.3; SD±17.0					
Internal Consistency results using Cronbach's alpha	0.998 Test 1 M=23.7; SD±15.6 Test 2 M=23.3; SD±17.0					

M = mean; SD = standard deviation.

The data in Table 3.7 display the Pearson's *r* and Cronbach's alpha results. The Pearson's *r* results (*r*=0.982, *p*=0.121) show a very high correlation (Taylor, 1990: 37) for knowledge, and therefore a strong relationship but with no statistical significance between the professional categories and knowledge scores for test 1 and test 2. Similarly, the output generated using Cronbach's alpha reliability analysis (alpha=0.947) shows a high level of internal consistency between the test and retest scores between professional categories for knowledge scores.

The attitude scores for test 1 and test 2 across the professional categories, using Pearson's *r* analysis (*r*=0.939, *p*=0.224), show a very high correlation and

therefore a reliable relationship that did not achieve statistical significance. The Cronbach's alpha reliability analysis for attitude (alpha=0.933) shows a high level of reliability between test 1 and test 2 scores across the professional categories.

There was a very high positive correlation between professional category and practice scores (r=1.000, n=3, p=0.016) for Pearson's r analysis, and this reached statistical significance, indicating that variability is due to true differences between scores (Karanicolas et al., 2009: 99). The Cronbach's alpha reliability analysis for practice shows high internal reliability between test 1 and test 2 scores across the professional categories (alpha=0.998).

However, the results have to be interpreted with caution due to the small pilot sample (n=3/77, 3.8%), which falls far short of an estimated pilot sample size of 10% (8/77) of the larger study recommended by Lackey and Wingate (1998:380). Raters were from the same professional categories as the main study to authenticate the reliability of the instrument (self-administered questionnaire) (Karanicolas et al., 2009:99). Despite the small sample size, the results of the Pearson's r and Cronbach's alpha suggest that the test instrument is stable, reliable and reproducible.

3.4.3.3 Summary of the validation process

The self-administered questionnaire (Appendix 1) was subject to content and face validity testing, after which changes were made to the instrument. The amended self-administered questionnaire was thereafter subject to inter-rater reliability testing, which showed a very high positive correlation and therefore strong relationship between the variables examined for Pearson's r. However, statistical significance was only achieved between professional category and practice scores. For all of the variables examined, Cronbach's alpha suggested that the test instrument is stable, reliable and reproducible.

The final amended questionnaire as recommended by the pilot study group was ready for use in the main study. This concluded the validation process of the questionnaire for data collection implementation in the main study.

3.5 Procedure for data collection

The discussion below outlines the steps followed for the data collection process.

3.5.1 Data collection method

3.5.1.1 Gaining access

Formal permission-seeking letters were written to the Management Head of the private dialysis provider, the Medical Superintendent of the tertiary hospitals and the Medical and Nursing Heads of the various dialysis centres (Appendix 4) requesting their permission for inclusion of their staff to participate in the study.

The letter outlined the purpose of study, ethical principles, which the researcher would adhere to, details of the UCT Faculty of Health Sciences Human Research Ethics Committee and ethics clearance number (Appendix 5A), the researcher and supervisor, the process for collecting data and the timeframe for returning the completed questionnaires.

Upon receiving written permission from the relevant authorising bodies, the researcher made telephonic contact with the Unit Managers to arrange a meeting. The purpose of the face-to-face meeting was to inform them of the study and to provide them with copies of the ethics clearance and the permission letters from the various employing authorities that allowed the researcher access to the dialysis centres and the Unit Manager.

A discussion of the entire process for data collection occurred in the privacy of each of the six Unit Managers' offices. Everyone verbalised that they understood the process of data collection and no clarification was required. No contact was made with the seventh dialysis centre Unit Manager due to waiting for authorisation from the employing body. A timeframe was agreed on with the six Unit Managers for when written consent was to be obtained from all potential respondents who met the inclusion criteria. An agreement was made regarding the distribution of the self-administered questionnaire (Appendix 1), the completion date of the survey (the researcher and Unit Managers agreed on a 2-week deadline), and the collection and return of the completed forms.

The researcher prepared packs of questionnaires for each participating dialysis centre. The questionnaire cover page (Appendix 1) was individualised for each participating dialysis centre, with the contact person's name for a new questionnaire, date for completion for the questionnaire, and the name of the person to whom the respondent needed to hand the sealed envelope with the completed questionnaire.

Contact was made with Unit Managers to deliver the blank questionnaires in unsealed envelopes. As part of a quality control measure, the researcher documented the number of blank questionnaires delivered to compare against returned completed questionnaires. Unit Managers were informed during the data collection period that the researcher could be contacted via telephone or email for clarity on any aspects of the questionnaire.

Permission was received for access to the seventh dialysis centre 2 weeks after commencing data collection at the other six-dialysis centres. The limitation encountered for access to the seventh dialysis centre was having no personal contact with the Unit Manager of that dialysis centre –communication was through the Nursing Department of the hospital. The questionnaire envelopes were hand-delivered to the hospital Nursing Department secretary; she was informed of the data collection process, so that in turn she could convey the process of data collection to the Unit Manager.

3.5.2 Data management

Neuman (2011:383) asserts that before data can be analysed to test the hypotheses, it must be set up in a specific form so that interpretation via different statistical software on computer can occur. The process adopted is discussed in the sections below.

3.5.2.1 Analysis of data from closed-ended questions

Data from 36 closed-ended questions (of the total 45 questions) for each completed questionnaire (Appendix 1) were read and checked before being captured on pre-coded Microsoft® Office Excel® 2007 spreadsheets. Q024 and

Q035 had sub-sections. In total, one questionnaire yielded 44 or 45 responses (allowing for options). Q031 had 4 options (Appendix 1), so if option 4 was chosen, this required an answer for Q032 and 45 questions would have been answered. If a response other than 4 was chosen, respondents bypassed Q032 and only gave 44 responses.

Missing data were labelled as '1001' for each questionnaire item with a blank column. This missing data label (1001) was used when calculating descriptive and frequency statistics. Missing data labels were removed when calculating inferential statistics; these were changed to a blank space to reduce skewed interpretations.

For the management of numbers the second decimal was left out; for example, 45.87% became 45.9% and 45.83% became 45.8%. Due to numbers rounding off, the total percentage does not always compute to 100.0% but to 99.9% or 100.1%. Statistical results were rounded off to the first decimal, for example mean age 41.05 rounded off to 41.1 and standard deviation 10.818 rounded off to 10.8, however the *p*-values were read with three decimal points.

3.5.2.2 Analysis of data from open-ended questions

Data from the remaining 9 open-ended questions in Section A (Q001), Section B (Q006) and Section C (Q016 - Q022) (Appendix 1) were captured verbatim. Responses to the open-ended questions were analysed for thematic content and tallied for frequency of occurrence. A frequency table of codes (Appendix 11) depicts common themes.

Due to the small cohort of renal unit practitioners, the researcher treated incomplete questionnaires in the same manner as those with 100% responses and used the code '1001' to identify missing data in the initial raw data captured as shown in Table 3.8. However, the researcher is aware that the missing data can be a limitation for the study.

Table 3.8: Sample of pilot study respondents' Knowledge regarding UFH

Dialysis centre	Subject No.	Bleeding tendencies 010	UFH break clots 011	Effects of UFH 012	Admin. of UFH 013	Not give UFH, platelet counts 014	Method of arrest of bleeding 015	UFH not given oral 016	value of baseline urea 017	Route of UFH admin. 018
4	47	1	1	1	2	2	2	1001	1001	IV
	48	1	1	4	2	2	3	Because it is short-acting	1001	IVI
	49	1	1	4	2	2	3	Does not get absorbed by gut system	1001	IV in 30 ml syringe in driver of 5008

Note to table: IV/IVI = intravenous route

The Microsoft® Office Excel® 2007 spreadsheet with the captured raw data was password- protected and only the researcher had access to the laptop. The completed questionnaires will be stored in a steel locked cupboard and will be kept for two years after the completion of the study, should post-analysis be required, after which data will be shredded. As a back-up plan, a flash drive stored the captured information in case the laptop malfunctioned. The flash drive was kept in the steel locked cupboard storing the raw data. Deletion of the information on the flash drive will occur after a period of two years.

3.5.2.3 Statistical analysis

Statistical analysis involved the systematic reorganising and decoding of raw data from closed-ended questions into numerical codes. An electronic database was established which was password-protected to store the original Microsoft® Office Excel® 2007 spreadsheet in which raw data were captured. This database was used as a point of reference to clarify any errors noted before further statistical analysis. The Microsoft® Office Excel® 2007 spreadsheet had headings to capture the raw data from the 77 respondents. Each participating respondent's data were entered systematically with the dialysis centre code preceding the

respondent's allocated number for ease of identification and for reference purposes if discrepancies were noted.

The computer-allocated number was the same assigned to the hard copy of the respondent's questionnaire for easy identification and referencing purposes (Appendices 6–9). This quality control measure was adopted to ensure accuracy of data captured. The entire capturing of raw data took 2 weeks to complete.

IBM SPSS Statistics version 21 (2012) and 22 (2014) was used to analyse raw data for descriptive and inferential statistical analysis. At this stage, a statistician assisted in checking the pre-codes allocated for the different items on the questionnaire. What was determined was that the initial score system allocated was incorrect; therefore item reversal had to be done and the data were rechecked for consistency before any statistical analysis could be performed.

Scores of 1 and 2 were assigned to the correct answers for knowledge and practice questions and 0 was assigned to wrong answers. The answers to attitude questions were ranked 1–5 so that the score of 5 represented the best score for attitude.

A quartile test was performed to determine the inter-quartile KAP score for each dependent variable on the questionnaire. The 1st quartile represented the respondents' unacceptable low scores and the 3rd quartile the respondents' high scores; the median score of 50% was the 2nd quartile. There was speculation that KAP scores for most of the respondents from each professional category would be reflected in the 2nd quartile based on assumed baseline pharmacology knowledge of UFH from work experience and in-service education on UFH.

Presented in Table 3.9 are the statistical tests performed on captured data.

Table 3.9: Variables and statistical analysis

Demographic variables	Indicator variables	Data	Statistical analysis
Age (Q001) Experience (Q006)		Continuous	Measures of central tendency: Mean if normally distributed; Shapiro Wilk test for normality of data Spearman's rho test ANOVA, Scheffe post hoc test
Gender (Q002) Citizenship (Q003) Professional Category (Q004) Qualification (Q005) Orientation duration (Q008) UFH effects on clots (Q011) UFH effects (Q012) UFH administration in elevated blood pressure (Q013) UFH effects on platelets (Q014) Protamine sulphate dose to arrest bleeding (Q015) UFH not administered orally (Q016) Value of baseline urea levels (Q017) Route of administration of UFH (Q018) Type of UFH used (Q019) Temp. storage UFH (Q020) Effects of UFH on potassium (Q021) UFH dose calculation (Q022) Concerns regarding UFH (Q031) Consult for UFH information (Q034)	Male = 1; female = 2; South African =1; other = 2. 3 pre-listed 7 pre-listed	Categorical Categorical	Proportion and percentage Fisher's Exact Test Spearman's rho test ANOVA Scheffe post hoc test (Test objectives 1.7) Proportion & percentage Fisher's Exact Test and Spearman's rho test (test objectives 1.7)
Mentor (Q007) In-service (Q009) Bleeding tendencies (Q010)		Binary 1 = yes, 0=no	Proportion and percentage Fisher's Exact Test
UFH adverse effects (Q023) Attitude (Q024) Patient info re UFH (Q025) Patient info re - UFH adverse effect (Q26) Prescription UFH (Q027) Checking new patient coagulation results (Q028) Checking current patient coagulation result (Q029) Review UFH literature (Q030) Adjusting UFH dose (Q032) Witness UFH reaction(Q033) UFH practice related (Q035)		Ordinal 5-point rating Scale	Proportion and percentage dispersion: standard deviation (SD), Fisher's Exact test and Spearman's rho test (to test objectives in section 1.7)

Descriptive statistical analysis was performed as a baseline to obtain frequency distribution and measurement of central tendencies (for continuous data) for personal and professional demographics and KAP data. To analyse the categorical variables, cross-tabulations were performed using the Fisher's exact test to determine whether there was an association between selected variables (category of renal unit practitioner, years of experience, duration of orientation to the adult chronic haemodialysis unit and in-service education on the pharmacology of UFH) and KAP concerning the use and effects of UFH.

Application of the logistic regression model was to test the association between selected variables (as mentioned above) and KAP variables. Expression of strength of association was as an odds ratio (OR). A *p*-value of ≤0.05 and a CI of 95% denoted the association as statistically significant. Tables and graphs are used to illustrate the analysed data (Edwards & Talbot, 1999:134; Banerjee, 2004:10).

3.5.3 Quality assurance of data entries

For sampling, a random selection of 8 of 77 completed questionnaires (10.4%) was performed using the Microsoft® Office Excel® 2007 software. A nurse possessing a Master's degree in nursing assessed the quality of data entries copied from the hard copies of the questionnaires onto a Microsoft® Office Excel® 2007 spreadsheet. Of the sampled questionnaires (n=8), disagreements between recordings on the spreadsheet and on the questionnaires related to two (2.6%) of 77 respondents' captured data that had errors in three questions as shown in Table 3.10.

Table 3.10: Data entry sampling disagreements

Sample	Section C: Knowledge	Section D: Attitude	Section E: Practice
n = 8	1 (12.5%)	0 (100%)	2 (25.0%)

There was a 6.7% (3/45 questions) disagreement and 93.3% (42/45) agreement between recordings which was deemed acceptable as the predetermined level of acceptance was set at 95%. Incorrect entries on the Microsoft® Office Excel®

2007 spreadsheet were corrected for these two respondents. For consistency, a further check of the remaining 69 respondents' captured raw data was done against their completed questionnaires.

3.6 Ethical considerations

Approval of the study proposal was received from the Research Committee on 30 November 2012 and the UCT Faculty of Health Sciences Human Research Ethics Committee awarded the study approval number (FHS HREC Ref. 642/2012) on 9 January 2013 (Appendix 5). During March 2013 and April 2013, the researcher received approval from the participating tertiary hospitals and private dialysis companies to conduct the study. The principles of the Helsinki Declaration (2008) were maintained, including informed consent, non-maleficence and beneficence, privacy and confidentiality, autonomy and justice.

3.6.1 Informed consent

Potential research respondents were told of all relevant study information (Appendix 2), affirming that participation is voluntary. No monetary incentives were offered to respondents. However, as a token of appreciation the researcher gave cakes to the various units participating in the study.

3.6.2 Non-maleficence and beneficence

The self-administered questionnaire did not cause any psychosocial harm, no respondent contacted the researcher to verbalise experiencing emotional distress when completing the questionnaire, and no Unit Manager reported any staff experiencing emotional distress when completing the questionnaire. Three Unit Managers reported that some categories of staff refused to participate in the study, and one Unit Manager was keen to have the answers to the questionnaire for in-service training. The researcher honoured a pledge to do no harm to the respondents' psychosocial well-being.

All necessary precautions to protect respondents by employing sound scientific and ethical principles before, during and after the study were maintained by

upholding the principles of privacy, confidentiality, anonymity, autonomy and justice.

3.6.3 Privacy and confidentiality

To protect respondents and the employing dialysis centres, no names were divulged and respondents and dialysis centres were assigned code numbers for easy identification of data. Protection of privacy and confidentiality was maintained by providing self-sealing envelopes for the return of completed questionnaires. Using a computer statistical program the collected data collected were converted into figures and graphs, resulting in generalising the findings beyond a specific respondent or dialysis centre. Only the researcher and supervisor had access to the raw data that were stored in a locked cupboard, and the electronic version was password-protected.

3.6.4 Autonomy

Respondents had the final authority to either accept being part of the study or to decline, without any repercussions arising from their decision.

3.6.5 Justice

All respondents and their employing dialysis centres received fair and equal treatment and respect, ensuring no favouritism. The researcher did not manipulate information to meet the study outcomes.

3.7 Summary

This chapter examined the procedures followed for the study methodology, including the research design, study population, sample size, sampling method, recruitment, data collection instrument (design, validation and reliability testing) and pilot study. A discussion followed on the data collection method, data management and statistical analysis methods, quality assurance of data entries and ethical considerations of the study.

CHAPTER 4: RESULTS

4.1 Introduction

This chapter presents the results of the study. The research questions, aims, objectives and study hypothesis guided the results. Seven purposively selected adult dialysis centres in the Cape Town Metropole participated in the study, two (28.6%) tertiary government hospital dialysis centres and five dialysis centres (71.4%) from one private dialysis provider.

The primary purpose of the study was to describe renal unit practitioners' KAP regarding the use and effects of UFH in selected adult chronic haemodialysis centres in the Cape Town Metropole. The secondary purpose was to determine whether there is an association between selected variables (category of renal unit practitioner, years of experience, duration of orientation to the adult chronic haemodialysis unit and in-service education on the pharmacology of UFH) and renal unit practitioners' KAP concerning the use and effects of UFH.

The first research question addressed renal unit practitioners' KAP relative to the use and effects of UFH in selected adult chronic haemodialysis centres in the Cape Town Metropole. The second research question addressed an association between selected variables (professional category, years of experience, duration of orientation to the adult chronic haemodialysis unit and in-service education on the pharmacology of UFH) and renal unit practitioners' KAP concerning the use and effects of UFH.

Presented first in this chapter are the response rates as per dialysis centres and individuals, and thereafter, an overview of the questionnaire responses is presented. This is followed by presentation of the guidelines used to score the questionnaire and then the actual total results of the respondents' self-reported answers to the questionnaire, including the different tests employed to describe and analyse the objectives. An account of the STROBE checklist precedes the summary of this chapter.

4.2 Response rate

The estimated sample size was 82 (1.0% margin of error, 95% CI) and the return rate was 77 (94.0%), nevertheless, no questionnaires were excluded from the final data analysis even those with missing data.

4.2.1 Participating dialysis centres and individual responses

Heads of departments of all seven purposively selected dialysis centres allowed access to their renal unit practitioners for participation in the study. Data in Table 4.1 show the questionnaire return rates for each of the participating dialysis centres (n=7). Of the total population (N=104) of renal unit practitioners who met the inclusion criteria, 77 (74.0%) participated in the study compared to the estimated sample size (n=82, 93.9%).

Table 4.1: Questionnaire return rates by dialysis centre

Dialysis centres	Study population	No. of questionnaires distributed	No. of questionnaires returned	Percentage of questionnaires returned
Hospital 1	21	21	20	95.2
Hospital 2	29	29	15	51.7
Sub-total hospitals	**50**	**50**	**35**	**70.0**
Dialysis centre 1	12	12	11	91.7
Dialysis centre 2	13	13	7	53.8
Dialysis centre 3	19	19	17	89.5
Dialysis centre 4	4	4	4	100
Dialysis centre 5	6	6	3	50.0
Sub-total dialysis centres	**54**	**54**	**42**	**77.8**
Total 7	**104**	**104**	**77**	**74.0**

The data in Table 4.1 indicate that there was a 70.0% response rate (35/50) from tertiary hospital dialysis settings, and from the private dialysis centres, this was 77.8% (42/54). Overall the response rate was 74.0%, with 35/77 (45.5%) from the government sector and 42/77 (54.5%) from the private sector. One tertiary hospital

dialysis centre had a 95.2% (20/21) response rate and three private dialysis centres had response rates ranging between 89.5% (17/19) and 100% (4/4). Potential reasons for not all of the renal unit practitioners participating in the study may possibly be because some:

- were on annual, study or sick leave;
- did not want to participate;
- did not want to expose their true KAP regarding unfractionated heparin;
- did not feel the study was of importance;
- did not want to take time out of their personal or work schedule to complete the questionnaire;
- may have felt that their handwriting would have been recognized by the researcher.

4.2.2 Number of responses by questionnaire

One questionnaire yielded 44 or 45 answers. The 77 questionnaires of all respondents yielded 3388 responses, with missing data (Table 4.2) accounting for 169 (5.0%) of these.

Table 4.2: Missing data from responses to the questionnaire

Respondents (n=77)				
	Question No. (missing data)			
	Personal and professional	Knowledge	Attitude	Practice
	Q001 (3) Q003 (1) Q007 (1) Q009 (1)	Q010 (1) Q011 (1) Q012 (4) Q013 (3) Q014 (6) Q015 (2) Q016 (9) Q017 (17) Q018 (1) Q019 (7) Q020 (8) Q021 (15) Q022 (9)	Q023 (10) Q024a (3) Q024b (4) Q024c (4) Q024d (5) Q024e (3) Q024f (5) Q025 (5) Q026 (3)	Q027 (2) Q028 (4) Q029 (4) Q030 (2) Q031 (5) Q033 (4) Q034 (5) Q035a (1) Q035b (1) Q035C (1) Q035D (1) Q035e (4) Q035f (4)
Overall missing data per item for 77respondents (%)	6/693 (0.80)	83/1001 (8.2)	42/693 (6.0)	38/1001 (3.8)
Total missing data = 169/3388 (5.0)				

Data in Table 4.2 show that the highest proportion of missing data recorded was in Section C for knowledge regarding UFH (Q017 – 22.0%, 17/77; Q021 – 19.4%, 15/77). Overall most of the missing data were from the knowledge section (8.2%, 83/1001). Personal and professional demographics sections recorded the lowest proportion of missing data (0.8%, 6/693).

4.2.3 Guideline for scoring responses to questionnaires

Guidelines for scoring the correct responses were according to the literature reviewed for the development of the questionnaire (Appendix 10). The overall achievable scores for the questionnaire are shown in Table 4.3.

Table 4.3: Interquartile test scores for KAP variables

	Knowledge score (18 marks) 13 questions	Attitude score (41 marks) 9 questions	Practice score (50 marks) 14 questions
Valid	**77**	**77**	**77**
Missing	**0**	**0**	**0**
25 (1st quartile)	**8.5**	**24.0**	**32.5**
50 (median, 2nd quartile)	**10.0**	**27.0**	**37.0**
75 (3rd quartile)	**13.0**	**29.0**	**40.0**

The data in Table 4.3 show the overall achievable scores for the questionnaire by calculating the median and quartile range for each dependent variable: Knowledge, Attitude and Practice.

The total scores possible in the different sections if answered correctly were as follows:

- Knowledge, Section C (18 marks): For Q012 a score of up to 4 was allocated and for Q018 the respondent could score up to 3 marks. The other 11 questions scored a maximum of 1 mark each.
- Attitude, Section D (41 marks): Seven questions could achieve up to 5 marks and two questions 3 points.

- Practice, Section E (50 marks): Q032 was not taken into account when computing the score based on the assumption that not many respondents would have selected Q031d as a response. Therefore, nine questions could achieve 4 marks each; one question could have scored 3 marks; two of the questions could achieve scores of 5 marks and one could have scored 1 mark.

The 1st quartile represents respondents' low scores which were unacceptable, and the 3rd quartile represents the respondents' high scores which were highly impressive, with the median score of 50% or 2nd quartile as the average score or minimum acceptable score.

This implied that, for example, if a respondent scored 8.5 in the knowledge section the respondent had poor knowledge of UFH, and this was unacceptable. However, if the respondent scored 13 in the knowledge section this would be highly impressive, suggesting that they were knowledgeable regarding UFH.

4.2.4 KAP test results

Respondents' overall test scores achieved for KAP (objectives 1.7.1.1, 1.7.1.2 and 1.7.1.3) are presented in Table 4.4.

Table 4.4: Overall KAP scores

	Number of respondents	Minimum Score	Maximum score	Mean score	Std deviation
Knowledge scores (out of 18)	77	4	18	10.8	3.1
Attitude scores (out of 41)	77	0	35	25.9	6.0
Practice scores (out of 50)	77	19	44	35.8	6.0

The mean score: for knowledge was 10.8/18 (60.0%); for attitude 25.9/41 (63.2%); for practice 35.8/50 (71.6%).

Descriptive statistics were used for analysing respondents' demographic characteristics.

4.3 Description of respondents' demographic characteristics

This is a secondary objective (1.7.2) but will be described first as it relates to all the other objectives. This objective was to describe respondents' demographic and professional profiles (independent variables) and to determine the differences between the groups. Sections A and B (questions 1-9 of the questionnaire, Appendix 1) addressed these aspects.

4.3.1 Frequencies of demographic characteristics

Descriptive statistics were used to show the frequencies of the demographic characteristics (Raw data in Appendices 6-9, example of descriptive statistics Appendix 12A), which are presented in Tables 4.5 to 4.11 and Figures 4.1 to 4.6.

4.3.1.1 Descriptive analysis of demographic/professional characteristics

The mean age of 74/77 (96.1%) respondents was 41.1 years (range 23–64 years). The mean age of RNs was 44.9 years, for CTs the mean age was 31.4 for ENs this was 44.4 years.

Age distribution is presented in Table 4.5 and Figure 4.1.

Table 4.5: Respondents' age distribution (n=74/77)

Variable	Category	Number	%
Age (years)	21-25	6	8.1
	26-30	9	12.2
	31-35	11	14.9
	36-40	8	10.8
	41-45	10	13.5
	46-50	15	20.3
	51-55	10	13.5
	56-60	3	4.1
	61-65	2	2.7
	Subtotal	74	100
	Missing	3	3.9
	Total	77	100

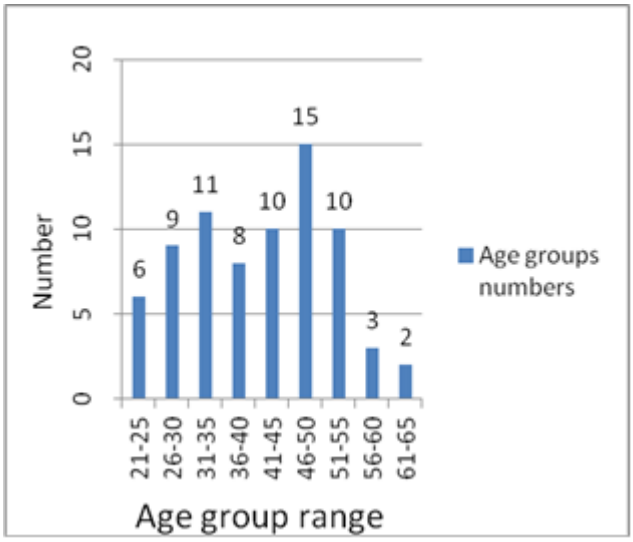

Figure 4.1: Age group distribution

The respondents' age data (range of 23 to 64 years) had wide differences and were therefore grouped into 5-year intervals. Data in Table 4.5 and Figure 4.1 show that of the 74/77 (96.1%) respondents, most (15/74, 20.3%) were in the 46-50-year age group.

Presented in Table 4.6 and Figure 4.2 is the gender and citizenship distribution.

Table 4.6: Distribution of gender and citizenship status

Variable	Category	Frequency	%
Gender	M	19	24.7
	F	58	75.3
	Total	77	100
Citizen	SA	73	96.1
	Other	3	3.9
	Subtotal	76	100
	Missing	1	1.3
	Total	77	100

M = male; F = female; SA = South Africa.

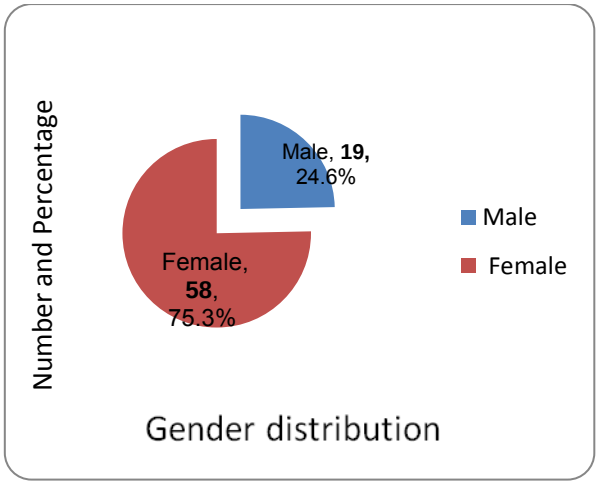

Figure 4.2: Gender distribution

Data in Table 4.6 and Figure 4.2 indicate that there were more female respondents (75.3%, 58/77) than males, and that the majority (94.8%, 73/77) of respondents were South African citizens.

Presented in Table 4.7 is the distribution of respondents' professional categories and qualifications/training experiences.

Table 4.7: Distribution of professional categories and qualifications/training experiences

Variable	Category	Frequency	%
Professional category	Registered Nurse	51	66.2
	Clinical Technologist	21	27.3
	Enrolled Nurse	5	6.5
	Total	77	100
Qualification	PGDNN	7	9.1
	Dip CC	8	10.4
	Dip Nephro CT	11	14.3
	B Tech Nephro CT	8	10.4
	OJT	32	41.6
	PGDNN + Dip CC	2	2.6
	Dip CC + OJT	6	7.8
	Dip Nephro CT + B Tech Nephro CT	1	1.3
	Dip Nephro CT + OJT	1	1.3
	PGDNN + Dip CC + OJT	1	1.3
	Total	77	100

PGDNN = Postgraduate Diploma in Nephrology Nursing; Dip CC = Diploma in Critical Care; Dip Nephro CT = Diploma in Nephrology Clinical Technology; B Tech Nephro CT= Bachelor Technical Degree in Nephrology Clinical Technology; OJT = on the job training.

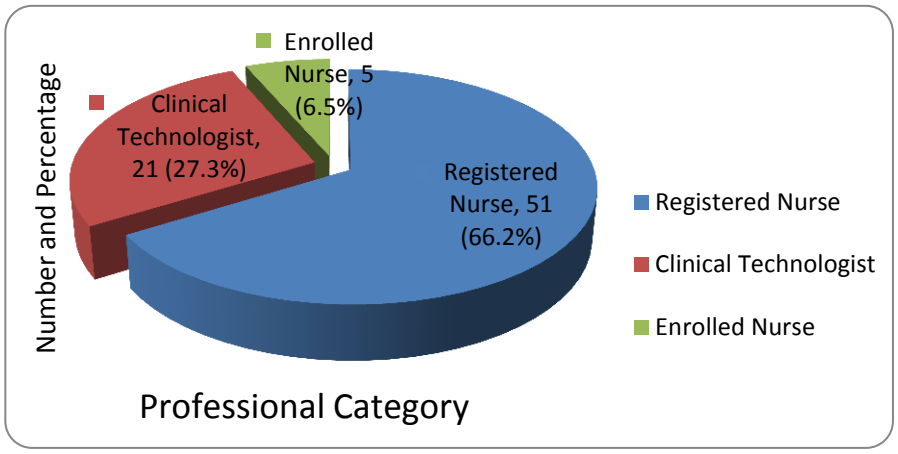

Figure 4.3: Distribution of professional category

Data in Table 4.7 and Figure 4.3 show that of the 77 respondents, Registered Nurses accounted for 66.2% (n=51). Most respondents (41.6%, 32/77) indicated that they had received on-the-job training.

Presented in Table 4.8 and Figure 4.4 is the distribution of respondents' years of experience.

Table 4.8: Distribution of years of experience

Variable	Category	Frequency number	%
Years of Experience	0-5	41	53.2
	6-10	10	13.0
	11-15	10	13.0
	16-20	5	6.5
	21-25	3	3.9
	26-30	6	7.8
	31-35	1	1.3
	36-40	1	1.3
	Total	77	100

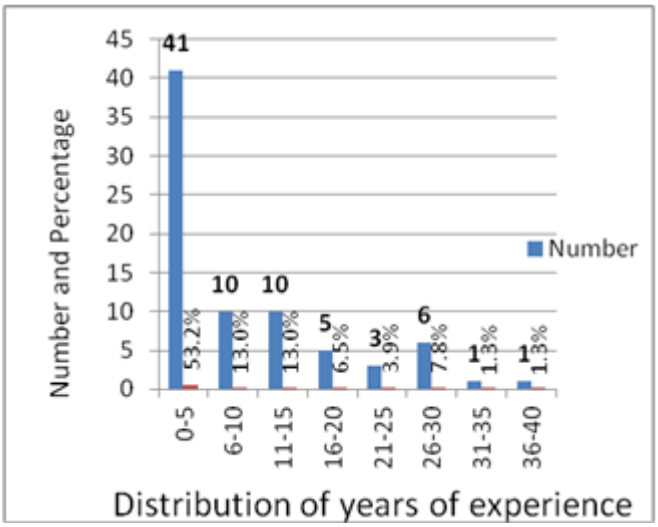

Figure 4.4: Distribution of years of experience

Respondents' years of experience were grouped into 5-year intervals. Data in Table 4.8 and Figure 4.4 indicate that most respondents (53.2%, 41/77) had 0–5 years of experience.

The numbers of participants who had/had not (yes/no) received orientation by a mentor are presented in Table 4.9.

Table 4.9: Distribution of orientation by mentor

Variable		Frequency Number	%
Orientation by mentor	Yes	54	71.1
	No	22	28.9
	Subtotal	76	100
	Missing	1	1.3
	Total	77	100

Data in Table 4.9 indicate that the majority of respondents (71.1%, 54/76) reported that they had received orientation by a mentor, whereas 28.9% (22/76) had received no orientation.

Presented in Table 4.10 and Figure 4.5 are the distributions of respondents' self-reported duration of orientation (days, weeks, months, and not applicable).

Table 4.10: Distribution of duration of orientation

Variable	Category	Frequency	%
Duration of orientation	Orientation in progress	1	1.3
	Days	1	1.3
	Weeks	25	32.5
	Months	30	39
	N/A	20	26
	Total	77	100

N/A = not applicable because no orientation received.

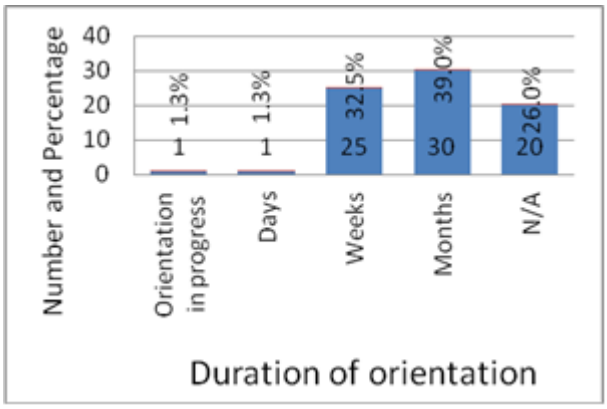

Figure 4.5: Duration of orientation

Data in Table 4.10 and Figure 4.5 indicate that 25/77 (32.5%) of renal unit practitioners received weeks of orientation, while 38.9% (30/77) had received months of orientation. Only one respondent was currently on orientation during the period of study.

The number of participants who had and who had not (yes/no) received in-service education on UFH is presented in Table 4.11 and Figure 4.6.

Table 4.11: Distribution of in-service education on UFH pharmacology

Variable	Category	Frequency	%*
In-service education on UFH	Yes	29	37.7
	No	47	61.0
	Subtotal	76	98.7
	Missing	1	1.3
	Total	77	100

*Calculation out of 77.

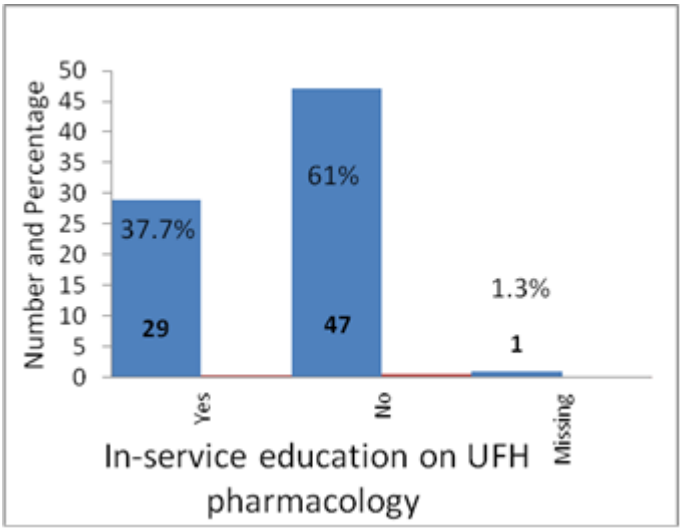

Figure 4.6: Frequency of in-service education on UFH

Data in Table 4.11 and Figure 4.6 indicate that 61.0% (47/77) of respondents reported that they did not receive in-service education on UFH pharmacology, while 29/77 (37.7%) stated they did receive in-service education on UFH pharmacology while working in haemodialysis centres. Only one respondent (1/77, 1.3%) did not respond whether he/she did /did not receive in-service education on UFH pharmacology.

In summary, data in Table 4.5 show that there were more missing data for the age variable (3/77, 3.9%) than for citizenship, orientation and in-service education, which each had one set (1.3%) of missing data. The data in Table 4.7 show that Registered Nurses (10/51, 19.6%) and Clinical Technologists (9/21, 42.8%) had the highest postgraduate renal unit practitioner qualifications.

Thereafter, inferential statistical analyses showed the association between variables in relation to respondents' demographic and professional characteristics.

4.3.1.2 *Inferential statistical analysis: respondents' demographic characteristics and professional category*

To assess for normal distribution of the data for the variables age and years of experience (continuous data) the Shapiro-Wilk test of normality (Table 4.12) was performed. The data for age in Table 4.12 were normally distributed (p=0.3) but not so for years of experience (p<0.001) which was lower than the reporting alpha of 0.05. The mean and standard deviations were calculated for age (M=41.1, SD±10.8).

Table 4.12: Test of normality for age and years of experience

	Shapiro-Wilk		
	Statistic	**df**	***p*-value**
Age	0.978	65	0.312
Years of experience	0.837	65	<0.001

df = degrees of freedom.

Inferential statistical analysis of data in Table 4.13 shows the association between variables relating to respondents' demographic characteristics (age, gender, citizenship and qualifications) and professional category.

Table 4.13: Association between respondents' demographic characteristics and professional category

Variables		Professional category RN (n=51) No. (%)	CT (n=21) No. (%)	EN (n=5) No. (%)	Mean	Standard deviation	Fisher's exact test *p*-value
Age (years)	21-25	1 (2.0)	5 (23.8)	0 (0.0)	41.1	10.8	0.002
	26-30	4 (7.8)	5 (23.8)	0 (0.0)			
	31-35	4 (7.8)	6 (28.6)	1 (20.0)			
	36-40	6 (11.8)	2 (9.5)	0 (0.0)			
	41-45	7 (13.7)	2 (9.5)	1 (20.0)			
	46-50	12 (23.5)	0 (0.0)	3 (60.0)			
	51-55	9 (17.6)	1 (4.8)	0 (0.0)			
	56-60	3 (5.9)	0 (0.0)	0 (0.0)			
	61-65	2 (3.9)	0 (0.0)	0 (0.0)			
	Missing	**3 (6.0)**	**0 (0.0)**	**0 (0.0)**			
	Total	**51 (100.0)**	**21 (100.0)**	**5 (100.0)**			
Gender	M	6 (11.8)	13 (61.9)	0 (0.0)			<0.001
	F	45 (88.2)	8 (38.1)	5 (100.0)			
	Total	**51 (100.0)**	**21 (100.0)**	**5 (100.0)**			
Citizen	SA	48 (94.1)	20 (95.2)	5 (100.0)			1.000
	Other	2 (3.9)	1 (4.8)	0 (0.0)			
	Missing	**1 (2.0)**	**0 (0.0)**	**0 (0.0)**			
	Total	**51 (100.0)**	**21 (100.0)**	**5 (100.0)**			
Qualification	PGDNN	7 (13.7)	0 (0.0)	0 (0.0)			<0.001
	Dip in CC	8 (15.7)	0 (0.0)	0 (0.0)			
	Dip in Nephro CT	0 (0.0)	11 (52.4)	0 (0.0)			
	B Tech Nephro CT	0 (0.0)	8 (38.1)	0 (0.0)			
	0JT	27 (52.9)	0 (0.0)	5 (100.0)			
	PGDNN+Dip CC	2 (3.9)	0 (0.0)	0 (0.0)			
	Dip CC+OJT	6 (11.8)	0 (0.0)	0 (0.0)			
	Dip Nephro CT+B Tech Nephro CT	0 (0.0)	1 (4.8)	0 (0.0)			
	Dip Nephro CT+OJT	0 (0.0)	1 (4.8)	0 (0.0)			
	PGDNN+Dip CC+OJT	1 (2.0)	0 (0.0)	0 (0.0)			
	Total	**51 (100.0)**	**21 (100.0)**	**5 (100.0)**			
Experience (years)	0-5	29 (56.9)	10 (47.6)	2 (40.0)	9.4	9.3	0.140
	6-10	4 (7.8)	4 (19.0)	2 (40.0)			
	11-15	5 (9.8)	4 (19.0)	1 (20.0)			
	16-20	5 (9.8)	0 (0.0)	0 (0.0)			
	21-25	1 (2.0)	2 (9.5)	0 (0.0)			
	26-30	6 (11.8)	0 (0.0)	0 (0.0)			
	31-35	0 (0.0)	1 (4.8)	0 (0.0)			
	36-40	1 (2.0)	0 (0.0)	0 (0.0)			
	Total	**51 (100.0)**	**21 (100.0)**	**5 (100.0)**			
Orientation by mentor	Yes	35 (68.6)	17 (81.0)	2 (40.0)			0.300
	No	16 (31.4)	4 (19.0)	2 (40.0)			
	Missing	**0 (0.0)**	**0 (0.0)**	**1 (20.0)**			
	Total	**51 (100.0)**	**21 (100.0)**	**5 (100.0)**			
Duration of orientation	On orientation	1 (2.0)	0 (0.0)	0 (0.0)			0.073
	Days	0 (0.0)	1 (4.8)	0 (0.0)			
	Weeks	14 (27.5)	6 (28.6)	5 (100.0)			
	Months	22 (43.1)	8 (38.1)	0 (0.0)			
	Not applicable	14 (27.5)	6 (28.6)	0 (0.0)			
	Total	**51 (100.0)**	**21 (100.0)**	**5 (100.0)**			
In-service of UFH	Yes	13 (25.5)	11 (52.4)	5 (100.0)			<0.001
	No	37 (72.5)	10 (47.6)	0 (0.0)			
	Missing	**1 (2.0)**	**0 (0.0)**	**0 (0.0)**			
	Total	**51(100.0)**	**21 (100.0)**	**5 (100.0)**			

Note to table: PGDNN = Postgraduate Diploma in Nephrology Nursing; Dip CC = Diploma in Critical Care;

Dip Nephro CT = Diploma in Nephrology Clinical Technology; BTech Nephro CT= Bachelor Technical Degree in Nephrology Clinical Technology; OJT = on the job training; M = male; F = female; UFH = unfractionated heparin

Data in Table 4.13 indicate that the mean age of the respondents was 41.1 years. Registered Nurses were the oldest, that is >60 years (2/48, 4.2%) (mean age 44.9 years by one-way ANOVA with 3 missing data, Appendix 12A), and the Clinical Technologists were the youngest, that is <25 years of age (5/21, 23.8%) (mean age 31.4 years, Appendix 12A). The mean age was 44.4 years for ENs (Appendix 12A). There was a statistically significant association (p=0.002, SD±10.8) between the variable professional category and age. A Scheffe post hoc test (Appendix 12A) showed that the difference in age between RNs and CTs reached statistical significance (p<0.001, 95% CI 7.56-19.41) and between ENs and CTs (p=0.02, 95% CI 1.70-24.24) but not between RNs and ENs.

Most of the Registered Nurses (88.2%, 45/51) were female, while most of the Clinical Technologists (61.9%, 13/21) were male. The association between gender and professional category reached statistical significance (p<0.001).

The majority (52.9%, 27/51) of the Registered Nurses reported that they received on-the-job training, whereas all of the Enrolled Nurses (100%, 5/5) were on-the-job trainees. Ten of the 51 (19.6%) Registered Nurses had a Postgraduate Diploma in Nephrology Nursing qualification, while 42.8% (9/21) of the Clinical Technologists had a Bachelor Technical degree in Nephrology Clinical Technology. There was a statistically significant association (p<0.001) between the variable professional category and qualifications.

The majority of the Registered Nurses (56.9%, 29/51) and Clinical Technologists (47.6%, 10/21) had <5 years' experience in haemodialysis. The respondents' mean years of experience was 9.4 (SD±9.3). There was no statistically significant association (p=0.140) between the variable professional category and years of experience.

Of the 51 Registered Nurses, 31.4% (16/51) reported that they had not received orientation by a mentor and 27.5% (14/51) reported that the duration of orientation did not apply to them. A smaller proportion (19.0%, 4/21) of Clinical Technologists

reported that they had not received orientation by a mentor and 28.6% (6/21) reported that the duration of orientation did not apply to them. Of the five Enrolled Nurses, 20.0% (1/5) did not respond to the question of orientation by a mentor. The same number (40%, 2/4) of Enrolled Nurses had/had not received orientation by a mentor. The duration of the orientation period for the Enrolled Nurses (100.0%, 5/5) was a matter of weeks. There was no statistically significant association between the variables orientation by mentor (p=0.300), duration of orientation (p=0.073) and professional category.

The majority of Registered Nurses (74.0%, 37/50) reported that they had not received in-service education on UFH, while the majority (52.4%, 11/21) of the Clinical Technologists reported that they had received such in-service education. There was a statistically significant association (p=0.001) between the variable professional categories and the in-service education on UFH that they had/had not received.

4.4 Respondents' self-reported knowledge of UFH

The first primary objective of the study (1.7.1.1) was to describe the respondents' self-reported knowledge (Appendix 7) of the use and effects of UFH (Table 4.14). Section C (Q010–022 of the questionnaire) (Appendix 1) addresses these aspects. The correct responses according to literature review are in bold. Table 4.14 reflects the frequency of responses, the distribution pattern among renal unit practitioners.

Table 4.14: Respondents' self-reported knowledge results by professional category

		Professional category (n=77)		
Questions	**Responses**	**RN (n=51) No. %**	**CT (n=21) No. %**	**EN (n=5) No. %**
Q010. Query bleeding tendencies before UFH is administered.	**Yes**	**51 (100.0)**	**19 (90.5)**	**5 (100.0)**
	No	0 (0.0)	1 (4.8)	0 (0.0)
	Missing	0 (0.0)	1 (4.8)	0 (0.0)
	Total	51 (100.0)	21 (100.0)	5 (100.0)
Q011. UFH breaks down blood clots?	Yes	25 (49.0)	4 (19.0)	1 (20.0)
	No	**25 (49.0)**	**16 (76.2)**	**3 (60.0)**
	Unsure	0 (0.0)	1 (4.8)	1 (20.0)
	Missing	1 (2.0)	0 (0.0)	0 (0.0)
	Total	51 (100.0)	21 (100.0)	5 (100.0)
Q012. Effects of administering UFH with low aPTT.	Bleeding	22 (43.1)	11 (52.4)	3 (60.0)
	Nil ill effects	12 (23.5)	1 (4.8)	0 (0.0)
	Bleeding and unscheduled hospitalisation	**16 (31.4)**	**8 (38.1)**	**0 (0.0)**
	Missing	1 (2.0)	1 (4.8)	2 (40.0)
	Total	51 (100.0)	21 (100.0)	5 (100.0)
Q013. Blood pressure reading of 240/140 mmHg. Administer UFH or not.	Yes	5 (9.8)	1 (4.8)	1 (20.0)
	No	**42 (82.4)**	**17 (81.0)**	**3 (60.0)**
	Unsure	4 (7.8)	1 (4.8)	0 (0.0)
	Missing	0 (0.0)	2 (9.5)	1 (20.0)
	Total	51 (100.0)	21 (100.0)	5 (100.0)
Q014. UFH not administered following platelet count.	420-450 x $10^{9/1}$	4 (7.8)	0 (0.0)	0 (0.0)
	50-80 x $10^{9/1}$	**41 (80.4)**	**15 (71.4)**	**4 (80.0)**
	150-180 x $10^{9/1}$	4 (7.8)	3 (14.3)	0 (0.0)
	Missing	2 (3.9)	3 (14.3)	1 (20.0)
	Total	51 (100.0)	21 (100.0)	5 (100.0)
Q015. Method to arrest bleeding post-haemodialysis session to counteract effects of UFH.	**PS 1 mg/ 100 IU UFH**	**23 (45.1)**	**5(23.8)**	**1 (20.0)**
	PS 2 mg/1000 IU UFH	10 (19.6)	8 (38.1)	3 (60.0)
	Vitamin K 1 mg	9 (17.6)	1 (4.8)	0 (0.0)
	Unsure	9 (17.6)	6 (28.6)	0 (0.0)
	Missing	0 (0.0)	1 (4.8)	1 (20.0)
	Total	51 (100.0)	21 (100.0)	5 (100.0)
Q016. Reason UFH not administered orally.	Effectiveness	4 (7.8)	0 (0.0)	0 (0.0)
	Effects	23 (45.1)	9 (42.9)	2 (40.0)
	Pharmacokinetics	9 (17.6)	1 (4.8)	0 (0.0)
	Destroyed by stomach acids	**10 (19.6)**	**8 (38.1)**	**0 (0.0)**
	Unsure	1 (2.0)	1 (4.8)	0 (0.0)
	Missing	4 (7.8)	2 (9.5)	3 (60.0)
	Total	51 (100.0)	21 (100.0)	5 (100.0)

Questions	Responses	Professional category (n=77) RN (n=51) No. %	CT (n=21) No. %	EN (n=5) No. %
Q017. Importance of having the patient's baseline urea values before administering the first dose of UFH.	**Bleeding risk**	**31 (60.8)**	**12 (57.1)**	**1 (20.0)**
	Increased urea levels	1 (2.0)	0 (0.0)	1 (20.0)
	Risk of complications	4 (7.8)	3 (14.3)	0 (0.0)
	Unsure	4 (7.8)	1 (4.8)	0 (0.0)
	Dosage	1 (2.0)	0 (0.0)	0 (0.0)
	Information	1 (2.0)	0 (0.0)	0.(0.0)
	Missing	9 (17.6)	5 (23.8	3 (60.0)
	Total	51 (100.0)	21 (100.0)	5 (100.0)
Q018. Route of administration of UFH.	Intravenously	37 (72.5)	11 (52.3)	2 (40.0)
	Via dialysis machine	13 (25.5)	7 (33.3)	2 (40.0)
	Bolus dosage	1 (2.0)	2 (9.5)	1(20.0)
	Missing	0 (0.0)	1 (4.8)	0 (0.0)
	Total	51 (100.0)	21 (100.0)	5 (100.0)
Q019. Type of UFH used.	**Porcine**	**20 (39.2)**	**7 (33.3)**	**1 (20.0)**
	Bovine	10 (19.6)	6 (28.6)	0 (0.0)
	Other	10 (19.6)	0 (0.0)	2 (40.0)
	Unsure	8 (15.7)	6 (28.6)	0 (0.0)
	Missing	3 (5.9)	2 (9.5)	2 (40.0)
	Total	51 (100.0)	21 (100.0)	5 (100.0)
Q020. UFH temperature storage.	Patient temp	1 (2.0)	0 (0.0)	0 (0.0)
	<25 degrees C	**32 (62.7)**	**18 (85.7)**	**2 (40.0)**
	>25 degrees C	6 (11.8)	1 (4.8)	0 (0.0)
	Room temp	6 (11.8)	1 (4.8)	2 (40.0)
	Missing	6 (11.8)	1 (4.8)	1 (20.0)
	Total	51 (100.0)	21 (100.0)	5 (100.0)
Q021. Effect UFH has on potassium level.	**Hyperkalemia**	**22 (43.1)**	**8 (38.1)**	**2 (40.0)**
	Nil	9 (17.6)	1 (4.8)	2 (40.0)
	Don't know	8 (15.7)	5 (23.8)	0 (0.0)
	Inhibit the secretion of aldosterone-hyperkalemia	**3 (5.9)**	**2 (9.5)**	**0 (0.0)**
	Missing	9 (17.6)	5 (23.8)	1 (20.0)
	Total	51 (100.0)	21 (100.0)	5 (100.0)
Q022. A patient needs to receive 2 000 IU in stock 20 000 IU of UFH. Calculate the dose of UFH.	**10 ml**	**32 (62.7)**	**15 (71.4)**	**0 (0.0)**
	2000 IU	0 (0.0)	2 (9.5)	0 (0.00
	10 ml-100 IU	0 (0.0)	1 (4.8)	0 (0.0)
	01-5 ml	5 (9.8)	0 (0.0)	0 (0.0)
	10-100	5 (9.8)	0 (0.0)	1 (20.0)
	1000 IU	3 (5.9)	0 (0.0)	0 (0.0)
	10 000 IU	1 (2.0)	0 (0.0)	0 (0.0)
	Formula only	2 (3.9)	0 (0.0)	1 (20.0)
	Missing	3 (5.9)	3 (14.3)	3 (60.0)
	Total	51 (100.0)	21 (100.0)	5 (100.0)

Note to table:
aPTT = activated partial thromboplastin time; C = Celsius; CT = Clinical Technologist; EN = Enrolled Nurse; IU = International Unit; PS = Protamine Sulphate; RN = Registered Nurse.
The correct responses according to the literature review are in bold.

The data in Table 4.14 indicate that 97.4% (75/77) of respondents correctly reported querying bleeding tendencies before administering UFH (Q010). One Clinical Technologist (1.3%, 1/77) opted not to respond. The question: does UFH break down blood clots (Q011) had an overall response rate of 98.7% (76/77). Collectively 57.1% (44/77) of respondents correctly reported “no” while 38.9% (30/77) incorrectly reported “yes”; only 2.5% (2/77) reported they were “unsure”. Q012 item (effects of administering UFH with a low aPTT) yielded a 94.8% (73/77) response rate. Only 31.1% (24/77) of respondents correctly selected the option of “bleeding and unscheduled hospitalisation” while most 46.7% (36/77) opted for “bleeding”, and 16.8% (13/77) selected “no ill-effects” will be experienced. Altogether, 5.2% (4/77) of respondents chose not to respond.

Q013 of whether to administer or not administer UFH to a patient with a blood pressure reading of 240/140 mmHg had an overall response rate of 96.1% (74/77). The majority of respondents 80.5% (62/77) correctly selected “no” as a response to not giving UFH in this instance, while 3.9% (3/77) of respondents did not respond.

The question: at which platelet count is UFH not administered (Q014) had a response rate of 92.2% (71/77). Overall 77.9% (60/77) of respondents accurately selected they would not give UFH if the patient’s platelet count was 50-80 x $10^{9/1}$, with 7.8% (6/77) of respondents not answering this question.

For Q015, method of arresting bleeding post-haemodialysis session to counteract effects of UFH, 37.6% (29/77) of respondents correctly chose protamine sulphate 1 mg per 100 IU of UFH as the dose to arrest bleeding. A small minority (2.6%, 2/77) did not respond to this question.

For Q016, an open response question about reasons that UFH is not administered orally, with answers grouped according to themes, 23.3% (18/77) of respondents answered correctly, while 11.7% (9/77) were either “unsure” or opted not to respond.

Q017 (importance of having the patient's baseline urea values before administering the first dose of UFH) had a correct response rate of 57.1% (44/77). This item yielded a large, 22% (17/77) non-response rate.

All responses to Q018 regarding administration of UFH via intravenous route or via the haemodialysis machine or bolus dose are in line with the expected response. In total 98.7% (76/77) selected one or the other response and only one (1.3%) respondent did not respond.

For Q019 regarding the type of UFH used in their dialysis centres, 36.3% (n=28/77) of respondents correctly reported the type of heparin which their unit used, with 9.0% (7/77) failing to respond.

Q020 was an open question that asked at which temperature UFH was stored. This received multiple responses, which are grouped according to themes. Of these grouped themes, 67.5% (52/77) of responses were acceptable, while 10.4% (8/77) opted not to respond.

For another open-ended question, Q021 on the effects of UFH on potassium level, themes were used to group the responses. Overall, two responses were acceptable, that is “aldosterone inhibits the secretion of potassium resulting in hyperkalemia” and “hyperkalemia”. These options were chosen by 48.1% (37/77) of respondents; however, 19.5% (15/77) did not respond to this question.

Finally, for Q022 that required calculation of the dose of UFH there was an 89.6% (69/77) response rate, with 61.0% (47/77) correctly calculating the dose while 10.4% (8/77) of respondents decided not to respond.

4.4.1 Association between selected independent variables and knowledge

The sub-objective (1.7.3.1) of the study was to determine whether there is an association between selected independent variables and knowledge concerning the use and effects of UFH. Section C (Q010–022 of the questionnaire) (Appendix 1) addresses these aspects. Table 4.3 and Appendix 10 guided the scoring of the respondents' responses to the knowledge questions to determine whether they had acceptable or unacceptable knowledge.

Cross-tabulations (Appendix 12B) were used to determine the association between the preselected independent variables and knowledge. Due to its reliability, the Fisher's exact chi-squared test was chosen as the reporting measurement of the p-value and results are presented in Table 4.15. However, subsequently, a Spearman's rho test was conducted for the variables years' of experience and knowledge to determine the correlation between the two variables and the result confirms that the correlation was not statistically significant.

Table 4.15: Association between selected independent variables and knowledge

		Knowledge		
		Acceptable No. (%)	**Poor No. (%)**	**Fisher's Exact Test *p*-value**
Professional category n=77	RN (n=51)	42 (72.4)	9 (47.4)	0.011
	CT (n=21)	15(25.9)	6 (31.6)	
	EN (n=5)	1 (1.7)	4 (21.1)	
Experience in years n=77*	0-5 (n=41)	32 (55.2)	9 (47.4)	0.604
	6-40 (n=36)	26 (44.8)	10 (52.7)	
Duration of orientation n=77	On orientation (n=1)	0 (0.0)	1 (5.3)	0.549
	Days (n=1)	1 (1.7)	0 (0.0)	
	Weeks (n=25)	20 (34.5)	5 (26.3)	
	Months (n=30)	22 (37.9)	8 (42.1)	
	Not Applicable (n=20)	15 (25.9)	5 (26.3)	
In-service education of UFH n=76	Yes (n=29)	19 (32.8)	10 (55.6)	0.101
	No (n=47)	39 (67.2)	8 (44.4)	

CT = Clinical Technologist; EN = Enrolled Nurse; RN = Registered Nurse; UFH= Unfractionated Heparin
*Adjustment of years of experience by knowledge both as continuous variables gave a Spearman's rho correlation of 0.571.

Data in Table 4.15 show that overall, 75.3% (58/77) of respondents had an acceptable level of knowledge regarding UFH while 24.6% (19/77) had poor knowledge. Within the three categories of respondents, most 82.3% (42/51) of the registered nurses had an acceptable level of knowledge. The majority 80.0% (4/5) of the enrolled nurses, although a small cohort, had a poor level of knowledge. There was a statistically significant association (p=0.011) between the variable professional category and self-reported knowledge of UFH.

The majority of respondents 41.5% (32/77) who had an acceptable level of knowledge of UFH had 0-5 years of experience. Ten of the 77 respondents (12.9%) who had 11-35 years of experience displayed poor knowledge of UFH. There was no statistically significant association between level of knowledge and the variables: years of experience (p=0.604), duration of orientation (p=0.549) and in-service education (p=0.101). For in-service education on UFH 1.3% (1/77) of respondents were not included in the calculation.

4.5 Description of self-reported attitude regarding UFH

The second primary objective of the study (1.7.1.2) was to describe the respondents' self-reported attitudes (Appendix 8) regarding the use and effects of UFH (Table 4.16). Section D (Q023–026 of the questionnaire) (Appendix 1) addressed these aspects. Interpretation of attitudes is subjective so, to increase objectivity, interpretation of participants' responses was guided by the reviewed literature and personal experience of the researcher. Acceptable responses are indicated in bold. For convenience and simplicity, the results are grouped for each professional category.

Table 4.16: Data showing respondents' attitudes concerning the use and effects of UFH

		Professional category		
		RN (n=51)	CT (n=21)	EN (n=5)
Question	**Responses**	**No. %**	**No. %**	**No. %**
Q023. Concerns regarding patient experiencing UFH adverse effects.	Least concern	0 (0.0)	1 (4.8)	0 (0.0)
	Concern	3 (5.9)	2 (9.5)	1 (20.0)
	Neutral	15 (29.4)	5 (23.8)	1 (20.0)
	Moderate concern	14 (27.5)	5 (23.8)	0 (0.0)
	Great concern	**13 (25.5)**	**6 (28.6)**	**1 (20.0)**
	Missing	6 (11.8)	2 (9.5)	2 (40.0)
	Total	51 (100.0)	21 (100.0)	5 (100.0)
Q024a. In-service education of UFH is important.	Neutral	0 (0.0)	1 (4.8)	0 (0.0)
	Moderately agree	2 (3.9)	6 (28.6)	0 (0.0)
	Strongly agree	**46 (90.2)**	**14 (66.7)**	**5 (100.0)**
	Missing	3 (5.9)	0 (0.0)	0 (0.0)
	Total	51 (100.0)	21 (100.0)	5 (100.0)
Q024b. Feel comfortable administering UFH prepared by others.	**SD**	**29 (56.9)**	**6 (28.6)**	**3 (60.0)**
	MD	4 (7.8)	2 (9.5)	0 (0.0)
	N	4 (7.8)	10 (47.6)	0 (0.0)
	MA	8 (15.7))	2 (9.5)	2 (40.0)
	SA	2 (3.9)	1 (4.8)	0 (0.0)
	Missing	4 (7.8)	0 (0.0)	0 (0.0)
	Total	51 (100.0)	21 (100.0)	5 (100.0)
Q024c. The reporting UFH adverse effect is punishable.	**SD**	**31 (60.8)**	**6 (28.6)**	**2 (40.0)**
	MD	6 (11.8)	8 (38.1)	0 (0.0)
	N	6 (11.8)	6 (28.6)	1 (20.0)
	MA	3 (5.9)	1 (4.8)	0 (0.0)
	SA	2 (3.9)	0 (0.0)	1 (20.0)
	Missing	3 (5.9)	0 (0.0)	1 (20.0)
	Total	51 (100.0)	21 (100.0)	5 (100.0)
Q024d. UFH adverse effects are reported in my dialysis centre.	SD	2 (3.9)	0 (0.0)	0 (0.0)
	MD	1 (2.0)	4 (19.0)	1 (20.0)
	N	7 (13.7)	5 (23.8)	1 (20.0)
	MA	9 (17.6)	7 (33.3)	0 (0.0)
	SA	**28 (54.9)**	**5 (23.8)**	**2 (40.0)**
	Missing	4 (7.8)	0 (0.0)	1 (20.0)
	Total	51 (100.0)	21 (100.0)	5 (100.0)
Q024e. Patients are monitored closely for UFH adverse effects.	SD	2 (3.9)	0 (0.0)	0 (0.0)
	MD	2 (3.9)	1 (4.8)	1 (20.0)
	N	6 (11.8)	8 (38.1)	0 (0.0)
	MA	11 (21.6))	7 (33.3)	2 (40.0)
	SA	**27 (53.0)**	**5 (23.8)**	**2 (40.0)**
	Missing	3 (5.9)	0 (0.0)	0 (0.0)
	Total	51 (100.0)	21 (100.0)	5 (100.0)
Q024f. Seeking advice for UFH dose preparation is ridiculed by colleagues.	**SD**	**24 (47.0)**	**8 (38.1)**	**2 (40.0)**
	MD	2 (3.9)	6 (28.6)	0 (0.0)
	N	4 (7.8)	5 (23.8)	2 (40.0)
	MA	2 (3.9)	2 (9.5)	0 (0.0)
	SA	14 (27.5)	0 (0.0)	1 (20.0)
	Missing	5 (9.8)	0 (0.0)	0 (0.0)
	Total	51 (100.0)	21 (100.0)	5 (100.0)

Question	Responses	Professional category RN (n=51) No. %	CT (n=21) No. %	EN (n=5) No. %
Q025. Patients are informed regarding UFH potential adverse effects.	**Always**	**11 (21.6)**	**2 (9.5)**	**4 (80.0)**
	Sometimes	30 (58.8)	18 (85.7)	0 (0.0)
	Never	6 (11.8)	1 (4.8)	0 (0.0)
	Missing	4 (7.8)	0 (0.0)	1 (20.0)
	Total	51 (100.0)	21 (100.0)	5 (100.0)
Q026. Patients are informed how to manage UFH adverse effects.	**Always**	**19 (37.3)**	**3 (14.3)**	**4 (80.0)**
	Sometimes	23 (45.1)	16 (76.2)	1 (20.0)
	Never	6 (11.8	2 (9.5)	0 (0.0)
	Missing	3 (5.9)	0 (0.0)	0 (0.0)
	Total	51 (100.0)	21 (100.0)	5 (100.0)

CT = Clinical Technologist; EN = Enrolled Nurse; MA = moderately agree; MD = moderately disagree; N = neutral; RN = registered nurse; SA = strongly agree; SD = strongly disagree.

Data in Table 4.16 regarding the adverse effects patients may experience from the administered UFH (Q023) indicate that overall, 25.9% (20/77) reported “great concern” regarding patients experiencing adverse effects from the administered UFH, while 24.6% (9/77) were moderately concerned and 27.2% (21/77) chose to remain neutral. There was a 13% (10/77) non-response rate for the question.

For Q024a there was 84.4% (65/77) agreement by respondents that in-service education on UFH should be provided before accepting responsibility for administering the medication to patients. Of all the respondents, 5.9% (3/51) of Registered Nurses did not respond to the question.

There was a 49.3% (38/77) response to indicate that respondents “did not feel comfortable administering the drug prepared by others” (Q024b), with a minority of Registered Nurses (7.8%; 4/51) not answering this question.

Half of the respondents (50.6%, 39/77) felt that “reporting of adverse effects will not result in punishment” (Q024c), while 3.8% (3/77) felt that “reporting of adverse effects of UFH will result in punishment”. Overall 5.19% (4/71) of respondents did not answer this question.

Thirty-four of 77 respondents (44.1%) reported that “adverse effects are reported in my dialysis centre” (Q024d); however, 6.5% (5/77) of respondents did not answer.

Of the 77 respondents, 34 (44.1%) reported that they strongly agreed that patients are monitored for the side-effects of UFH (Q024e), while 3 out of 51 (5.9%) Registered Nurses did not respond to the question.

Most respondents (44.1%, 34/77) strongly disagreed that seeking advice from colleagues regarding their uncertainty in dose preparation would be treated with ridicule, whereas 18.18% (14/77) strongly agreed that this was the case (Q024f). Five of the 51 Registered Nurses (9.5%) refrained from responding to this question.

Most respondents (62.3%, 48/77) reported that they “sometimes” informed patients of the potential adverse effects of UFH (Q025); however, 6.5% (5/77) of respondents did not participate in the question.

Forty of the 77 respondents (51.9%) reported that they “sometimes” informed patients about how to manage the adverse effects of UFH (Q026). Three of the 51 Registered Nurses (5.9%) declined to give their opinion.

In summary, data show that respondents’ lack of knowledge concerning the use and administration of UFH is reflected in their attitude to its use and administration. Interpretation of participants’ responses, guided by the reviewed literature and personal experience of the researcher revealed that RNs displayed an acceptable attitude (≥ 50% of respondents) for 5/9 (55.6%) of the questions. For ENs this was displayed for 4/9 (44.4%) of the questions and for CTs for 1/9 (11.1%) question.

4.5.1 Association between selected independent variables and attitude

The sub-objective (1.7.3.2) of the study was to determine whether there was an association between selected independent variables and attitude concerning the use and effects of UFH (Appendix 1; Section D, Q023–026). Cross-tabulations were used to determine the association between the preselected independent variables and attitude. Due to its reliability the Fisher's exact chi-squared test was chosen as the reporting measurement of the p-value and results are presented in Table 4.17. However, subsequently, a Spearman's rho test was conducted for the variables years' of experience and attitude to determine the correlation between the two variables and the result confirms that the correlation was not statistically significant.

Table 4.17: Association between selected independent variables and attitude

		Attitude		
		Positive No. (%)	**Negative No. (%)**	**Fisher's exact test *p*-value**
Professional category n=77	RN (n=51)	38 (69.1)	13 (59.1)	0.637
	CT (n=21)	14 (25.5)	7 (31.8)	
	EN (n=5)	3 (5.5)	2 (9.1)	
Experience in years* n=77	0-5 (n=41)	27 (49.1)	14 (63.6)	0.315
	6-40 (n=36)	28 (50.9)	8 (36.4)	
Duration of orientation n=77	On orientation (n=1)	0 (0.0)	1 (4.5)	0.119
	Days (n=1)	0 (0.0)	1 (4.5)	
	Weeks (n=25)	17 (30.9)	8 (36.4)	
	Months (n=30)	21 (38.2)	9 (40.9)	
	Not Applicable(n=20)	17 (30.9)	3 (13.6)	
In-service education on UFH n=76	Yes (n=29)	20 (37.0)	9 (40.9)	0.798
	No (n=47)	34 (63.0)	13 (59.1)	

CT = Clinical Technologist; EN = Enrolled Nurse; RN = Registered Nurse; UFH=Unfractionated Heparin

*Adjustment of years of experience by attitude, both as continuous variables gave a Spearman's rho correlation of 0.254.

Data in Table 4.17 show that most Registered Nurses (74.5%; 38/51) and Clinical Technologists (66.6%; 14/21) had a positive attitude concerning the use and effects of UFH. Among the small cohort of enrolled nurses (60.0%; 3/5), there was a positive attitude towards the use and effects of UFH. There was no statistically significant association between professional category and attitude *(p*=0.637).

Overall, renal unit practitioners with 0–5 years of experience (65.9%; 27/41) presented the most positive attitude towards the use and effects of UFH. A minority of respondents, 10.3% (8/77) with 6–30 years of experience, had negative attitudes toward the use and effects of UFH. Twenty-eight of the 77 respondents (36.3%) who had 6–40 years of experience had a positive attitude towards the use and effects of UFH. The association between years of experience and attitude towards UFH did not reach statistical significance (*p*=0.315).

Seventy-one per cent (55/77) of the respondents showed a positive attitude towards the use and effects of UFH during their duration of orientation but the association was not statistically significant (*p*=0.119). Although 72.3% (n=34/47) of respondents did not receive in-service education for UFH, results reveal that they had a positive attitude concerning the use and effects of UFH. The association between in-service education for UFH and attitude was not statistically significant *(p*=0.798).

The results of the Fisher's exact chi-squared test revealed that there were no significant association between the selected variables and attitude.

4.6 Description of self-reported practice regarding UFH

The third primary objective of the study (1.7.1.3) was to describe the respondents' self-reported practice (Appendix 9) with regard to the use and effects of UFH. Section E, Q027–035 of the questionnaire (Appendix 1), addresses these aspects. Data in Table 4.18 display the results for the different professional categories of respondents (N=77) for each question. The reviewed literature and the researcher's clinical experience guided the interpretation of responses for the

practice results. The words in bold in each question item indicate the appropriate responses.

Table 4.18: Data showing respondents' self-reported practice regarding UFH

Questions		Professional category RN (n=51) No.%	CT (n=21) No.%	EN (n=5) No.%
Q027 How often is the UFH dose administered as prescribed by the Nephrologists?	**Always**	**30 (58.8)**	**14 (66.7)**	**5 (100.0)**
	Usually	13 (25.5)	4 (19.0)	0 (0.0)
	Sometimes	4 (7.8)	1 (4.8)	0 (0.0)
	Never	2 (3.9)	2 (9.5)	0 (0.0)
	Missing	2 (3.9)	0 (0.0)	0 (0.0)
	Total	51 (100.0)	21 (100.0)	5 (100.0)
Q028 How often is a new dialysis patient's laboratory coagulation results checked prior to the administration of the first dose of UFH?	**Always**	**11 (21.6)**	**2 (9.5)**	**2 (40.0)**
	Usually	7 (13.7)	6 (28.6)	0 (0.0)
	Sometimes	19 (37.3)	7 (33.3))	2 (40.0)
	Never	12 (23.5)	5 (23.8)	0 (0.0)
	Missing	2 (3.9)	1 (4.8)	1 (20.0)
	Total	51 (100.0)	21 (100.0)	5 (100.0)
Q029 How often is a current dialysis patients' laboratory coagulation results checked?	Monthly	6 (11.8)	4 (19.0)	1 (20.0)
	Quarterly	**12 (23.5)**	**7 (33.3)**	**1 (20.0)**
	Annually	2 (3.9)	1 (4.8)	0 (0.0)
	Never	9 (17.6)	4 (19.0)	0 (0.0)
	Other	18 (35.3)	5 (23.8)	3 (60.0)
	Missing	4 (7.8)	0 (0.0)	0 (0.0)
	Total	51 (100.0)	21 (100.0)	5 (100.0)
Q030 When did you last refer to published literature on UFH?	Days	5 (9.8)	1 (4.8)	0 (0.0)
	Weeks	5 (9.8)	2 (9.5)	0 (0.0)
	Months	**18 (35.3)**	**11 (52.4)**	**2 (40.0)**
	Years	17 (33.3)	4 (19.0)	2 (40.0)
	Never	5 (9.8)	3 (14.3)	0 (0.0)
	Missing	1 (2.0)	0 (0.0)	1 (20.0)
	Total	51 (100.0)	21 (100.0)	5 (100.0)
Q031 When I am concerned about the prescribed dose of UFH for a patient I …	Continue administering the prescribed dose	1 (2.0)	0 (0.0)	0 (0.0)
	Inform UM	15 (29.4)	8 (38.1)	2 (40.0)
	Contact prescribing doctor	**28 (54.9)**	**8 (38.1)**	**3 (60.0)**
	*Adjust dose	4 (7.8)	3 (14.3)	0 (0.0)
	Missing	3 (5.9)	2 (9.5)	0 (0.0)
	Total	51 (100.0)	21 (100.0)	5 (100.0)
Q032 If I adjust the UFH dose, I then …	*Document adjust dose	3 (75.0)	3 (100.0)	
	Missing	1 (25.0)	0 (0.0)	
	Total	4 (100.0)	3 (100.0)	

Questions		Professional category RN (n=51) No. %	CT (n=21) No. %	EN (n=5) No. %
Q033 How long ago did you witness an adverse effect of UFH?	Days	5 (9.8)	2 (9.5)	1 (20.0)
	Weeks	8 (15.7)	3 (14.3)	0 (0.0)
	Months	17 (33.3)	8 (38.1)	1 (20.0)
	Years ago	10 (19.6))	3 (14.3)	0 (0.0)
	Never	9 (17.6)	4 (19.0)	2 (40.0)
	Missing	2 (3.9)	1 (4.8)	1 (20.0)
	Total	51 (100.0)	21 (100.0)	5 (100.0)
Q034 In order of preference, indicate which of the following you will consult for information about UFH or other medication used in your adult chronic haemodialysis unit.	Doctor	23 (45.1)	9 (42.9)	3 (60.0)
	Formulary book	**11 (21.6)**	**2 (9.5)**	**0 (0.0)**
	Nurse	3 (5.9)	4 (19.0)	0 (0.0)
	Pharmacist	12 (23.5)	3 (14.3)	2 (40.0)
	Missing	2 (3.9)	3 (14.3)	0 (0.0)
	Total	51 (100.0)	21 (100.0)	5 (100.0)
Q035a I ask patients about bleeding tendencies prior to administering UFH dose.	Never	3 (5.9)	1 (4.8)	0 (0.0)
	Usually	3 (5.9)	3 (14.3)	0 (0.0)
	Sometimes	18 (35.3)	15 (71.4)	1 (20.0)
	Always	**26 (51.0)**	**2 (9.5)**	**4 (80.0)**
	Missing	1 (2.0)	0 (0.0)	0 (0.0)
	Total	51 (100.0)	21 (100.0)	5 (100.0)
Q035b I monitor patients for anaphylactic shock.	Never	4 (7.8)	2 (9.5)	0 (0.0)
	Usually	5 (9.8)	4 (19.0)	0 (0.0)
	Sometimes	8 (15.7)	7 (33.3)	1 (20.0)
	Always	**33 (64.7)**	**8 (38.1)**	**4 (80.0)**
	Missing	1 (2.0)	0 (0.0)	0 (0.0)
	Total	51 (100.0)	21 (100.0)	5 (100.0)
Q035c I verify allergies with patients prior to administering UFH.	Never	7 (13.7)	6 (28.6)	0 (0.0)
	Usually	3 (5.9)	1 (4.8)	0 (0.0)
	Sometimes	12 (23.5)	8 (38.1)	1 (20.0)
	Always	**28 (54.9)**	**6 (28.6)**	**4 (80.0)**
	Missing	**1 (2.0)**	**0 (0.0)**	**0 (0.0)**
	Total	**51 (100.0)**	**21 (100.0)**	**5 (100.0)**
Q035d I confirm the UFH dose with another qualified renal unit practitioner before I administer it.	Never	1 (2.0)	1 (4.8)	0 (0.0)
	Usually	9 (17.6)	2 (9.5)	0 (0.0)
	Sometimes	14 (27.5)	6 (28.6)	0 (0.0)
	Always	**26 (51.0)**	**12 (57.1)**	**5 (100.0)**
	Missing	**1 (2.0)**	**0 (0.0)**	**0 (0.0)**
	Total	**51 (100.0)**	**21 (100.0)**	**5 (100.0)**
Q035e I document adverse effects of UFH.	Never	2 (3.9)	0 (0.0)	0 (0.0)
	Usually	5 (9.8)	3 (14.3)	0 (0.0)
	Sometimes	2 (3.9)	1 (4.8)	0 (0.0)
	Always	**40 (78.4)**	**16 (76.2)**	**4 (80.0)**
	Missing	**2 (3.9)**	**1 (4.8)**	**1 (20.0)**
	Total	**51 (100.0)**	**21 (100.0)**	**5 (100.0)**

Questions		Professional category RN (n=51) No. %	CT (n=21) No. %	EN (n=5) No. %
Q035f I inform the Unit Manager of patient adverse effects to UFH.	Never	1 (2.0)	0 (0.0)	0 (0.0)
	Usually	3 (5.9)	1 (4.8)	0 (0.0)
	Sometimes	5 (9.8)	3 (14.3)	0 (0.0)
	Always	**39 (76.5)**	**16 (76.1)**	**5 (100.0)**
	Missing	**3 (5.9)**	**1 (4.8)**	**0 (0.0)**
	Total	**51 (100.0)**	**21 (100.0)**	**5 (100.0)**

Note to table: UM = Unit Manager.

*****Q032 linked to Q031.

The data in Table 4.18 show the frequency of prescribed UFH (Q027) as: 65.3% (49/75) of respondents indicated that they always give a dose of UFH as prescribed by the Nephrologists. Most of the positive responses were from the Registered Nurses (61.2%, 30/49) and Enrolled Nurses 100.0% (5/5). A small cohort of respondents (12.0%, 9/75) selected undesirable responses such as "never" and "usually". Of the Registered Nurses 3.9% (2/51) declined to respond to the question.

Regarding the checking of new patients' laboratory coagulation studies (Q028), only 19.2% (14/73) of respondents reported that they "always" checked them prior to administering the first dose of UFH, while 79.4% (58/73) stated that they "usually", "sometimes" or "never" check a new patient's laboratory coagulation results prior to administering the first dose of UFH. Of respondents, 5.2% (4/77) did not respond to the question.

There were different practices noted on how often a current patient's laboratory coagulation result was checked (Q029). Overall 35.6% (26/73) of the respondents selected "other", while 17.8% (13/73) selected "never". Of the registered nurses, 25.5% (12/47) selected "quarterly", while 33% (7/21) of Clinical Technologists selected this option as the time-period for checking a patient's coagulation studies. Of Registered Nurses, 7.8% (4/51) did not respond to the question.

Results for respondents' most recent reference to the published literature on UFH (Q030) revealed that 10.6% (n=8/75) of respondents never referred to published literature on UFH. Thirty-four per cent (n=17/50) of Registered Nurses admitted to

doing so “years ago”. Most Clinical Technologists (52.4%, 11/21) claimed having done so in the “past months”. Only 2.6% (2/77) of the respondents did not respond to the question.

If concerned about the prescribed dose of UFH (Q031) 54.1% (39/72) of the respondents would contact the prescribing doctor. Of the respondents, 58.3% (28/48) were Registered Nurses. Thirty-five per cent (25/72) of respondents said they would inform the Unit Manager if concerned regarding the patient’s prescribed dose of UFH, and 9.7% (7/72) said they would self-adjust the dose of UFH.

Responses to Question 032 were linked to option 4 of Q031 about respondents’ practice of adjusting the dose of UFH. Of the 9.8% (7/72) of respondents who chose option 4 in Q031, 85.7% (6/7) reported that they would document the adjusted dose they had administered on the patient’s records.

The time when respondents last witnessed an adverse event relating to UFH (Q033) varied: 8/73 (10.9%) selected “days”, 17.8% (13/73) of respondents selected “years”, and 20.5% (15/73) selected “never”. No statistically significant difference was noted (p=0.890). There were 5.2% (4/77) of respondents, who did not respond to this question.

Information-seeking behaviour on UFH (Q034) revealed that most respondents 48.6% (35/72) selected “Doctors” as their point of reference for information on UFH and other medication, with only 18.0% (n=13/72) selecting the formulary book as their first point of reference. Of the respondents, 6.5% (5/77) did not respond to the question.

Responses for verification of bleeding tendencies before administering UFH (Q035a) showed that most respondents (42.1%, 32/76) reported “always” asking patients about bleeding tendencies before administering UFH, while 44.8% (34/76) reported that they “sometimes” ask, and 7.9% (6/76) that they “usually” ask. Two percent (1/51) of the Registered Nurses did not respond to the question.

In terms of monitoring patients for anaphylactic shock (Q035b), 59.2% (45/76) of respondents confirmed that they "always" monitor patients for anaphylactic shock post-administration of UFH, while 7.89% (6/76) of respondents "never" do so. Two per cent (1/51) of the Registered Nurses did not respond to the question.

On verifying allergies with patients prior to administering UFH (Q035c), 50.0% (38/76) of respondents reported that they "always" do so, and most of the Registered Nurses (56.0%, 28/50) confirmed that they did so. However, 17.1% (13/76) of the respondents revealed that they do not check allergies with patients prior to administering UFH. Only 1.3% (1/77) of respondents did not respond to the question.

Regarding confirming the dose of UFH with another qualified practitioner (Q035d), 43 of 76 (56.5%) respondents reported that they "always" confirm the UFH dose with another qualified practitioner before administering it. Among the Enrolled Nurses, there was a 100% (5/5) response to always checking the dose with another qualified practitioner. Only 2.6% (2/76) of renal unit practitioners report that they "never" check the UFH dose with another person. One Registered Nurse refrained from answering the question.

Most respondents (82.1%, 60/73) reported that they document adverse effects of UFH (Q035e). Four of the 77 (5.2%) respondents did not participate.

Sixty of the 73 (82.1%) respondents reported that they "always" inform the Unit Manager of patients experiencing adverse effects to UFH (Q035f). Four of the 77 (5.2%) respondents did not answer the question.

4.6.1 Association between selected independent variables and practice

The last sub-objective (1.7.3.3) of the study was to determine whether there was an association between selected variables and practice concerning the use and effects of UFH. Section E (Appendix 1, Q027–035 of the questionnaire) addresses these aspects. Cross-tabulations were used to determine the association between the preselected independent variables and practice. Due to its reliability, the Fisher's exact chi-squared test was chosen as the reporting measurement of the

p-value and results are presented in Table 4.19. However, subsequently, a Spearman's rho test was conducted for the variables years' of experience and practice to determine the correlation between the two variables and the result confirms that the correlation was statistically significant.

Table 4.19: Association between selected independent variables and practice

		Practice		Fisher's exact test *p*-value
		Acceptable No. (%)	Unacceptable No. (%)	
Professional category n=77	RN (n=51)	38 (65.5)	13 (68.4)	0.517
	CT (n=21)	15 (25.9)	6 (31.6)	
	EN (n=5)	5 (8.6)	0 (0.0)	
Experience in years n=77*	0-5 (n=41)	26 (44.8)	15 (78.9)	0.016
	6-40 (n=36)	32 (55.2)	4 (21.1)	
Duration of orientation n=77	On orientation (n=1)	0 (0.0)	1 (5.3)	0.601
	Days (n=1)	1 (1.7)	0 (0.0)	
	Weeks (n=25)	19 (32.8)	6 (31.6)	
	Months (n=30)	23 (39.7)	7 (36.8)	
	Not applicable (n=20)	15 (25.9)	5 (26.3)	
In-service education of UFH n=76	Yes (n=29)	26 (45.6)	3 (15.8)	0.028
	No (n=47)	31 (54.4)	16 (84.2)	

CT = Clinical Technologist; EN = Enrolled Nurse; RN = Registered Nurse; UFH = Unfractionated Heparin.

*Adjustment of years of experience by practice, both as continuous variables gave a Spearman's rho correlation of 0.009.

Across the different professional categories of renal unit practitioners, the results reveal that most had acceptable practice competency regarding UFH. The association between the independent variable professional category and the dependent variable practice was not statistically significant (p=0.517).

Of the respondents with 0–5 years' experience, 63.4% (26/41) had acceptable practice competency and 36.5% (15/41) unacceptable practice competency. Therefore, in terms of years of experience, an acceptable practice competency was evident amongst most of the respondents. The association between years of experience and self-reported practice concerning UFH was statistically significant

(p=0.016), therefore further analysis was done using a logistical regression model test.

Across the range of duration of orientation, there was good practice even from the respondents (15/20, 75.0%), who reported having received no orientation. There was no statistically significant association (p=0.601) between duration of orientation variable and self-reported practice of UFH.

The results of the Fisher's exact chi-squared test revealed that the association between in-service education and practice reached statistical significance (p=0.028) and this was further analysed using the logistic regression model test.

4.7 Bivariate analysis: variables associated with knowledge and practice

Since there was no statistically significant association between respondents' attitude regarding the use and effects of UFH and the four pre-selected variables[2], no further analysis was performed on the dependent variable attitude.

Bivariate logistic regression analysis was performed on the dependent variable knowledge for strength of association between this variable and one pre-selected variable, that is professional category, and for statistical significance before making further judgements about the null hypothesis. Data in Table 4.15 (Section 4.4.1) showed that only the variable professional category (p=0.011) was significantly associated with poor knowledge. The outcome of that analysis determined the exact degree of the relationship between these variables.

Data in Table 4.20 reflect the results of the bivariate logistic regression analysis (Appendix 12C) of the relationship between professional category and poor knowledge scores. To test the professional category of registered nurses against the other categories of renal unit practitioners, the registered nurses data was used a reference in the first line of Table 4.20.

[2] Professional category, years of experience, duration of orientation, and in-service education

Table 4.20: Relationship between the variable professional category and poor knowledge

Factors	B	SE	Wald Chi-square	df	P value	OR	95% CI for EXP (B) Lower	Upper
Professional category (reference)			6.509	2	0.039			
Clinical Technologist	0.624	0.607	1.058	1	0.304	1.867	0.568	6.132
Enrolled Nurse	2.927	1.177	6.185	1	0.013	18.667	1.859	187.406
Constant	-1.540	0.367	17.588	1	<0.001	0.214		

Factors are compared with the Registered Nurse category.
B = coefficient for the constant; SE = Standard error around the coefficient for the constant; df = degrees of freedom for the Wald chi-square test; EXP (B) = Exponentiation of the B coefficient which is an OR – strength of the relationship.

Data in Table 4.20 show that the odds of the Enrolled Nurses having poor knowledge regarding UFH compared to the Registered Nurses were 18.7 times higher at a 95% CI (1.9-187.4), and this difference reached statistical significance (p=0.013). The odds of the Clinical Technologists having poorer knowledge than the Registered Nurses were 1.9 times higher, at a 95% CI (0.6-6.1), but this difference did not reach statistical significance (p=0.304).

Bivariate logistic regression analysis was performed on the dependent variable practice for strength of association between this variable and two pre-selected variables, that is years of experience and in-service education (yes/no), and for statistical significance before making further judgements about the null hypotheses. Data in Table 4.19 (Section 4.6.1) showed that years of experience influenced poor practice, and this difference reached statistical significance (p=0.016). Data in Table 4.21 reflect the results of analysis of the exact degree of the relationship between the variable years of experience and poor practice.

Table 4.21: Relationship between years of experience and poor practice

Factor	B	SE	Wald Chi-square	df	P value	OR	95% CI for Exp (B) Lower	Upper
0 to 5 years of experience	1.529	0.622	6.054	1	0.014	4.615	1.365	15.607
Constant	-2.079	0.530	15.374	1	<0.000	0.125		

Factors compared with six to forty years of experience.
B = coefficient for the constant; SE = Standard error around the coefficient for the constant; df = degrees of freedom for the Wald chi-square test; EXP (B) = Exponentiation of the B coefficient which is an OR – strength of the relationship.

Data in Table 4.21 showed that the respondents who had five years and less experience were 4.6 times more likely to deliver poor practice at a 95% CI (1.4–15.6) than respondents who had more than six years of experience, and this difference reached statistical significance (*p*=0.014).

Data in Table 4.19 (Section 4.6.1) showed that those who did not receive in-service education on the pharmacology of UFH had poor practice, and this difference reached statistical significance (*p*=0.028). Data in Table 4.22 reflect the results of analysis of the exact degree of the relationship between the variable in-service education on the pharmacology of UFH and poor practice.

Table 4.22: Relationship between in-service education and poor practice

Factor	B	SE	Wald Chi-square	df	P value	OR	95% CI for Exp (B) Lower	Upper
No In-service	1.466	0.682	4.619	1	0.032	4.333	1.138	16.505
Constant	-2.159	0.610	12.543	1	<0.001	0.115		

Factors compared with response 'Yes 'to having received in-service education.
B = coefficient for the constant; SE = Standard error around the coefficient for the constant; df = degrees of freedom for the Wald chi-square test; EXP (B) = Exponentiation of the B coefficient which is an OR – strength of the relationship.

Data in Table 4.22 showed that the respondents who had no in-service education on the pharmacology of UFH were 4.3 times more likely to deliver poor practice at a 95% CI (1.1–16.5) than respondents who did receive in-service education on the pharmacology of UFH, and this difference reached statistical significance (*p*=0.032).

The outcome of the logistic regression test confirms rejection of the null hypotheses, that the variables professional category, years of experience and in-service education (on the pharmacology of UFH) do not influence renal unit practitioners' KAP. However, the variable duration of orientation does not affect the renal unit practitioners' KAP therefore the null hypothesis is accepted for this variable.

4.8 STROBE checklist

To ensure clarity in the reporting of the results, the 2007 STROBE guidelines (Vandenbroucke et al., 2007) were used to ensure that every important aspect of a cross-sectional study was attended to. Table 5.1 in the discussion chapter which follows displays the procedure followed to complete the study.

4.9 Summary

This chapter delivered a detailed report of the results of the study according to the research questions, aims, objectives and the null hypothesis. To conclude this section the STROBE checklist was mentioned as a point of reference to ensure that the different aspects of a cross-sectional design study were followed and are reported on in Chapter 5.

CHAPTER 5: DISCUSSION, LIMITATIONS, IMPLICATIONS, RECOMMENDATIONS AND CONCLUSION

5.1 Introduction

Chronic haemodialysis treatment is the most common renal replacement therapy for patients diagnosed with Stage 5 adult End Stage Kidney Failure (ESKF). The main purpose of chronic haemodialysis therapy is to restore the body's homeostasis, during which 200-250 mls/minute of the patient‘s blood volume is extracorporeal and heparinised to prevent clotting. The patient is at risk of bleeding if the administered individualised dose of unfractionated heparin is not appropriate.

The primary purpose of the study was to describe renal unit practitioners' knowledge, attitude and practice (KAP) regarding the use of unfractionated heparin in selected adult chronic haemodialysis centres in the Cape Town Metropole. The secondary aim was to determine whether there is an association between selected variables (category of renal unit practitioner, years of experience, duration of orientation to the adult chronic haemodialysis unit and in-service education on the pharmacology of unfractionated heparin) and the KAP of renal unit practitioners. The aims of the study were achieved by objectives.

5.2 Study findings in relation to published studies

5.2.1 Renal unit practitioners' personal and professional demographic characteristics

Findings relate to secondary objective 1.7.2 (respondents' demographic and professional profiles and differences between the groups). Using Erik Erikson's 1959 theory of the eight stages of psychosocial development (McLeod, 2008:1), it is possible to classify the respondents in the present study into stages six (the young adult group aged 18 to 40 years) and seven (the middle adulthood group aged 40 [41] to 65 years). Erikson's theory suggests that individuals experience various psychological crises at different ages and their needs may conflict with that of society (McLeod, 2008:2). Study findings show that most of the staff (40/77)

employed at the research sites were in stage seven, the middle adulthood age group of 40-65 years. A potential psychological disadvantage for this age group is that if their needs are unfulfilled, they may experience 'stagnation and feel unproductive' (McLeod, 2008:4).

Five of the 15 ENs in the research sites participated in the study, comprising the smallest category of renal unit practitioners to do so. The overall scope of practice of ENs in South Africa is limited and they are not allowed to practice independently only under the direct or indirect guidance of the Registered Nurse (SANC, Regulation No. 2598 of 1984, as amended). This has implications for the usefulness of employing ENs in the haemodialysis services and the most suitable number of ENs needed. Legislative constraints for scope of practice hinders specialist training of the EN. The South African Nursing Council has no additional accredited postgraduate training programme available for them, besides the bridging programme of (SANC, Regulation No. 683 of 1989, as amended) which does lead to a qualification as a General Nurse or Psychiatric Nurse.

The majority of participants (70.1%, 54/77) reported that a mentor orientated them when they commenced working in the haemodialysis centre. It is good practice (Community Tool Box, 2013:2) in haemodialysis centres to ensure that new staffs are assigned to a mentor for orientation before they are assigned to care for a patient. Although respondents reported that the orientation training had been conducted over months this did not include in-service education on unfractionated heparin, a high alert medication, for 61.0% (47/77) of respondents.

5.2.2 Renal unit practitioners' self-reported knowledge

Findings relate to primary objective 1.7.1.1 (knowledge of UFH). Renal unit practitioners lacked knowledge regarding UFH and thought that unfractionated heparin breaks down blood clots (39.0%, 30/77). Research reports that UFH prevents clots forming, but does not break down formed clots (Fischer, 2007:178; Lankshear, Harden & Simms, 2010:49) as UFH is not a fibrinolytic agent. Another important study finding is that 59.7% (46/77) of respondents did not know the correct antidote or dosage for managing unfractionated heparin overdose.

Published literature reports that the correct dose to neutralise 100IU of UFH is 1mg of protamine sulphate (European Best Practice Guidelines Expert Group on Haemodialysis, 2002:65; Baglin et al., 2006:28; Lankshear et al., 2010:51; Lemon & Crannage, 2011:212). The majority of renal unit practitioners (65.0%, 50/77) did not know the reason for not administering UFH orally, which is that it is poorly absorbed (Hirsch et al., 1998:409S).

More than half of the respondents were not aware of the type of unfractionated heparin used in their dialysis centres. The UFH information pamphlet retrieved from the seven dialysis research sites confirmed that the UFH in use in these settings is a porcine (pork) derivative (Appendix 12). This finding is of concern because if patients are allergic to pork it is uncertain whether the allergic reaction will be associated with the administered UFH. Additionally, it is not known whether patients who do not eat pork for religious reasons are informed that they are receiving UFH which is a porcine derivative. According to Shen and Winkelmayer (2012:475), “porcine heparin carries a greater risk of anaphylaxis”. Respondents’ inability to calculate correct dosages of unfractionated heparin was surprising and of deep concern because this can have life-threatening consequences for patients. Ashby (1997:90) and Barkhouse-Mackeen and Murphy (2013:91) reported that nurses could not correctly calculate medication dosages and that their calculation knowledge was limited. Bayne and Bindler (1988:261), Polifroni, McNulty and Allchin (2003:458) and Wright (2007a:279) also reported concerns about medication errors resulting from poor calculation skills.

In summary, the appeal from International Health Organisations (NPSA, 2006; ISMP, 2008; Institute for HealthCare Improvement, 2008; Agency for Healthcare Research and Quality, n.d.) and Suranyi and Chow (2010:386) that nurses [renal unit practitioners] must regularly review and update their knowledge regarding unfractionated heparin cannot be over emphasised. This includes teaching renal unit practitioners how to do drug calculations.

5.2.3 Renal unit practitioners' attitude to UFH administration

Findings relate to primary objective 1.7.1.2 (attitude regarding the use and effects of UFH). Renal unit practitioners' lack of knowledge regarding the use and administration UFH was reflected in their responses in the attitude section of the questionnaire. Extrapolation of meaning that poor knowledge translates to having a poor attitude has to be interpreted with caution. Nevertheless, for question 023 only 20/77 respondents were greatly concerned about patients experiencing side-effects of UFH, and this implies a casual attitude regarding such a high alert medication. Furthermore, less than half of the respondents, (38/77, 49.4%) did not feel comfortable administering UFH that had been prepared by others and this is supported in the published literature (Chevalier et al., 2011:344).

The respondents combined response rates of 71.4% (55/77) for choosing "sometimes" and "never" to inform patients of the potential adverse effects of UFH is disconcerting. It is the haemodialysis patients' right to always be informed of benefits and potential adverse effects of medication prescribed and administered to them (National Institute for Health and Clinical Excellence, 2009:4). Of equal concern, 48/77 (62.3%) respondents reported that they "sometimes" or "never" informed patients how to manage UFH adverse effects.

5.2.4 Renal unit practitioners' practice

Findings relate to primary objective 1.7.1.3 (practice regarding UFH). Study findings suggest that currently, in the seven research sites, haemodialysis patients do not have a set schedule for having their coagulation studies checked. Pittard (2001:75) and Winkler et al. (2007:499) support the need for strict laboratory monitoring of coagulation studies of patients, to establish a therapeutic dose to prevent under-or over-anticoagulation. Respondents did not consider prolonged bleeding or clotting of patients' blood circuits (Pittard, 2001:74) to be adverse effects of UFH which may account for them not having recently witnessed an adverse event. Respondents had not kept up to date with literature specifically on UFH, a concern echoed by Ndosi and Newel (2008:570) and Raja et al. (2009:17) that, in general, nurses lack in-depth knowledge of medication.

5.3 Application of Benner's conceptual framework

Findings relate to sub-objective 1.7.3 (association between selected variables and KAP). An interpretation of how the renal unit practitioners' years of experience may be associated with the different stages of Benner's model follows. The findings of the study reveal that the majority of the Enrolled Nurses had a poor knowledge level of UFH. If renal unit practitioners are not knowledgeable about the medication they administer to patients, they can negatively affect patient safety. Benner reported that it is the responsibility of the nurse to monitor the safety and therapeutic responses to administered medication and that it can have a life and death implication (Benner, 1984:127). Nevertheless, other variables such as years of experience, duration of orientation and in-service education on the pharmacology were not significantly associated with self-reported knowledge level. However, for self-reported practice variable, years of experience and in-service education on the pharmacology of UFH does seem to affect the renal unit practitioners' clinical practice. The results suggest that renal practitioners with five years and less experience have a statistically significance chance of having poorer practice skills than those with greater than six years of renal unit experience. Those renal unit practitioners who had in-service education on the pharmacology of UFH had better clinical practice application as compared to those with no in-service education for UFH.

5.3.1 Novice practitioner

Eight of the 77 (10.4%) renal unit practitioners were considered to be a neophyte in the new discipline, since they had less than one year of experience. Benner (1984:22) suggested that this level of practitioner lacks sound expertise. It was therefore assumed that renal unit practitioners with less than two years of practice are at the level of novice or advanced beginner. When classifying a novice practitioner Benner did not stipulate time lines. Benner, Tanner and Chesla (1996:37) suggested that a new student entering nursing is a novice. However, analysing the overall outcome of knowledge scores for all respondents for what is acceptable and poor knowledge, there is no obvious disparity in terms of years of

experience, duration of orientation and in-service education (on pharmacology for unfractionated heparin). This finding is perplexing, implying that these variables do not make a difference to knowledge. Of the novices, the odds were greater that RNs would have more knowledge than CTs or ENs.

5.3.2 Advanced beginner

Benner's (1996:48) study looked at the practices of new graduates with less than six months as practicing at the level of an advanced beginner. In haemodialysis practice, an assumption is that a renal unit practitioner practicing at an advance beginner level can possibly safely oversee the treatment plan of uncomplicated haemodialysis patients unaided. The researcher presumes that, as ten of the 77 (12.9%) renal unit practitioners had 1-2 years of experience (Appendix 6), Benner's definition of an advanced beginner may be applicable to them. Amongst the ten respondents, ENs and CTs with 1-2 years of experience had not received in-service education on the pharmacology of UFH and had a greater risk of poor knowledge compared to the Registered Nurses.

5.3.3 Competent practitioner

Benner (1984:25) estimates a competent practitioner as having 2-3 years of experience in the same job. However, a practitioner can progress to a competent level after one to two years of practice, depending upon the specialty area, but some complex patient assignments will occur after a certain time has elapsed (Benner, 2004:193). In the haemodialysis centre, there is a strong likelihood that the above can occur if there is a shortage of skilled specialty staff. The staffs assessed to be quick learners are fast-tracked in their clinical experiential learning, and accept greater patient care responsibility. Eleven of 77 (14.3%) renal unit practitioners had 3-4 years of experience and were considered to be practicing at the level of competent practitioner according to Benner (1984:25).

5.3.4 Proficient and expert practitioner

The two stages were collapsed for the purpose of this study Within the haemodialysis centre, a renal unit practitioner practising at a proficient level feels

confident to argue for and against the patient's prescribed treatment and defends his/her rationale for adjusting the renal care that the patient needs. The Unit Manager (with years of experience) of the haemodialysis centre or the shift leader are supposedly the experts and will be the decision makers for care of the renal patient in the absence of the Nephrologists.

Although 45/77 (58.4%) renal unit practitioners had between 4-40 years of experience it is difficult to presume that they were proficient or expert without further exploration of the data which was beyond the scope of the study. Benner (1984:31) acknowledges that after 3-5 years of experience with a similar patient population it could be assumed that a practitioner is proficient but she suggests that the time is an estimate and needs further exploration.

From a practice perspective, data from the present study suggest that the odds of delivering poor practice having ≤ five years of experience and no in-service education on the pharmacology of UFH were 4.6 times higher at a 95% CI (1.4–15.6) than for renal unit practitioners who had ≥ six years of experience (the difference reaching statistical significance p=0.014) and 4.3 times higher (CI 1.1–16.5) than for respondents who did receive in-service education (the difference reaching statistical significance p=0.032) respectively. Benner (2004:198) reported that not all nurses will achieve expert status because of the challenges they experience. Because the renal unit practitioners' data were not analysed in-depth for application to Benner's construct, it will be incorrect to presume that respondents were experts.

To summarise, the results of the KAP study for renal unit practitioners' years of experience do not fully support Benner's grouping of the years of experience from novice to expert as the novices seem to be knowledgeable, regarding UFH and one reason is perhaps they had a structured orientation programme that included an in-service education on UFH pharmacology. However, from a practice perspective it does seem as if years of experience and in-service education on the pharmacology of UFH does influence renal practitioners clinical practice for UFH

and therefore may support the different stages of Benner's model for practice, but needs further exploration.

5.4 Strengths and limitations of the study in relation to published studies

5.4.1 Limitations of the study methods

Limiting the search strategy to published studies on renal unit practitioners' KAP regarding the use and effects of UFH limited the scope of the literature review. Had the search strategy included studies related to KAP among health practitioners and thromboprophylaxis more broadly, more studies would have been located. The services of a librarian should have been sought early in the study to source more published literature pertinent to this study. Not using the same search terms for all databases may have introduced bias and limited access to relevant literature.

A descriptive cross-sectional design using a self-administered questionnaire, was adopted for this KAP study, to address the research questions since descriptive research presents the picture of the "why "and "how" of people behaviour or situation (Fouche & DeVos, 2011:96) as it occurs naturally (Polit & Beck, 2004:192). However, in hindsight structured individual interviews may have resulted in less missing data (total missing data = 169/3388 (5.0%) than a self-administered questionnaire. Missing data should have been addressed in the section on validity of the test instrument and interpretation of the data.

A negative characteristic of a KAP study is that the respondents may give socially desirable answers and this could have an influence on the outcome of the study (Aubert et al., 1998:1143). However, as the self-administered questionnaire ensured respondents' anonymity, responses were honest.

The attitude section of the questionnaire was the most difficult to develop as this is a subjective component. In this study attitude was measured directly using Likert scales. Questions to elicit attitude were based on respondents' knowledge and practice regarding the use and effects of UFH warranting cautious interpretation of

responses. A limitation was that once the questionnaire design was completed, a statistician should have been consulted to check the internal consistency of construction of questions before the experts validated the questionnaire. However, for this study a post hoc internal consistency of the questionnaire was performed, but not included in dissertation.

There are ten other dialysis centres in the Cape Town Metropole, that could have been included in this study, but because they are private dialysis centres, permission to have access to their renal unit practitioners was difficult to obtain. This resulted in only seven dialysis centres in the Cape Town Metropole being involved in the study, therefore findings cannot be generalised to other dialysis centres. The protocol for obtaining approval for performing research at public sector Tertiary Hospitals has stringent measures in place and this delayed the planned early execution of the study.

The study did not achieve the estimated sample size of 82 (1.0% margin of error, 95% CI) instead of which 77/82 (93.9%) respondents participated and this has implications for informing the implementation of the results

Three expert reviewers reported the questionnaire as having content and face validity, but they stated that the construction of some of the questions needed amendment, and these were attended to. There were problems with the pilot study sample size (n=3 of an estimated 82, 4%) for testing the instrument reliability, as it fell short of an estimated pilot sample size of 10% (8/82; n=12) as recommended by Lackey and Wingate (1998:380). Therefore, the results will have to be interpreted with caution. Despite the small pilot sample size, the results of the Pearson's *r* and Cronbach's alpha suggest that the test instrument is stable, reliable and reproducible. However, the reliability testing of the instrument may have been strengthened had Intra-class Correlation coefficient, Cohen's kappa or Fleiss kappa test been performed as well as construct validity of the instrument. Data for years of experience were not equally distributed, therefore the median for nonparametric analysis should have been used rather than the mean.

Professional category as an independent variable should not have been included as a measure against dependent variables KAP because of the unequal distribution of the different professional categories. This may have affected the statistical power of the different results. Therefore the overall interpretation of results wherever professional category was tested, will have to be interpreted with caution. In hindsight, perhaps the term dialysis personnel without differentiating between the categories of professionals should have been used as an independent variable. Alternatively, the ENs could have been excluded as they do not have a specialist nephrology qualification.

Another shortcoming of the self-administered questionnaire was including both open- and closed questions. In retrospect, the questionnaire design should have consisted only of closed questions to better quantify the responses. The open-ended questions allowed broad responses that required grouping into themes with the risk of error of interpretation. A further shortcoming was question 006, which required the respondents to state their experience in months or years which some failed to do. Inaccuracies resulted which may have influenced the test of normality result as the degree of freedom count for age and years of experience (df = 65 and not 77) was reduced. There ought to have been better construction of question 031 so that question 032 was not linked to it. Retrospectively, the incomplete questionnaires should have been discarded instead of including them in the data analysis phase.

The study would have been strengthened if a minimum acceptable knowledge score had been set such as a more clinical criterion based on patient safety and what practitioners should know, benchmarked at the 75% quartile level.

The analysis of the data for application of Benner's model was superficial as it was not a research objective.

5.4.2 Strengths and evaluation of the study

This study was evaluated using the STROBE checklist (Table 5.1) to ensure that all the important aspects of a descriptive cross-sectional study were attended to.

Table 5.1: STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

	Item No	Recommendation	Application to study Relevant sections
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	Title page
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	Page vi
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	1.1 1.2 1.9 Chapter 2
Objectives	3	State specific objectives, including any prespecified hypotheses	1.7 1.8
Methods			
Study design	4	Present key elements of study design early in the paper	2.2 3.2
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	Page vi 3.3 3.5
Participants	6	Give the eligibility criteria, and the sources and methods of selection of participants	3.3
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	1.6
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	Appendix 1 3.4
Bias	9	Describe any efforts to address potential sources of bias	3.3.5
Study size	10	Explain how the study size was arrived at	3.3.3
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	3.5.2
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	3.5.2
		(*b*) Describe any methods used to examine subgroups and interactions	3.5.2
		(*c*) Explain how missing data were addressed	3.5.2
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	3.3.3 3.3.4 Table 3.10
		(e) Describe any sensitivity analyses	3.5.2 Table 3.9
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg; numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	4.2.
		(b) Give reasons for non-participation at each stage	4.2.1
		(c) Consider use of a flow diagram	not applicable
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	4.3 Tables 4.5; 4.11 Figures 4.1; 4.6
		(b) Indicate number of participants with missing data for each variable of interest	4.2.2

	Item No	Recommendation	Application to study Relevant sections
Outcome data	15*	Report numbers of outcome events or summary measures	4.2.4 Table 4.4
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	4.2.3 4.4; 4.9 Tables 4.14; 4.16; 4.18
		(*b*) Report category boundaries when continuous variables were categorized	Not applicable
Main results continued		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	Not done
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	4.3.1.2 4.5.1 4.6 4.7 Tables 4.12; 4.13; 4.15; 4.17; 4.19 Tables 4.20; 4.21; 4.22
Discussion			
Key results	18	Summarise key results with reference to study objectives	5.2.1-5.2.4
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	5.4
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	5.2; 5.3
Generalisability	21	Discuss the generalisability (external validity) of the study results	5.5; 5.6 ;5.7
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	Page 111

5.5 Implications of the study findings

The study findings have implications for nephrology practice, clinical management teams, education and research.

Study findings confirm that the limited statutory scope of practice of ENs (SANC, Regulation No. 2598 of 1984 as amended) was reflected in their poor knowledge of UFH and this has implications for their placement in haemodialysis units. In South Africa, there is no opportunity for Enrolled Nurses to pursue specialist training. The only career pathway for them is the South African Nursing Council bridging training programme (SANC, Regulation No. 683 of 1989, as amended) to become a Registered Nurse.

Study findings show that safety measures with regard to the use and administration of UFH may not have been optimum and this includes haemodialysis patients not having a set schedule for having their coagulation studies checked to assess their risk profile for bleeding or clotting. There was little evidence that respondents kept up to date with literature concerning UFH. Data suggest that haemodialysis patients may not know how to manage the adverse effects of UFH that they may potentially experience.

If, in terms of Erikson's theory, most respondents (who are in the middle adulthood group) feel that their needs are unfulfilled, they may experience stagnation and feelings of unproductiveness (McLeod, 2008:3). This has implications for further research.

5.6 Recommendations

Recommendations are based on the findings of this study and are applicable to nephrology practice, clinical management teams, patient teaching and educational curricula and for research in nephrology practice.

5.6.1 Recommendations for clinical management teams

If the patients' clinical management team is functioning optimally, renal unit practitioners' KAP should improve. For the management team to function optimally, it is recommended that the questionnaire (Appendix 1) relating to all aspects of UFH should be administered to new and existing renal unit practitioners (RNs, CTs and ENs) to assess their KAP and to monitor their progress. To prevent medical litigation, management teams should be proactive, ensuring there is a well-co-ordinated and active in-service education programme that includes aspects such as pharmacology, pharmacokinetics, pharmacodynamics, medication calculation and pharmaco-therapeutics. Teaching should be problem-based and applicable to the clinical area of haemodialysis. Staff should be made aware of increasing patient's mortality risk that can result in medico-legal liabilities and increase financial claims and losses against them as individuals and their employing body. To always "do no harm" to patients in their care thus, limiting the

patients and families exposure to avoidable physical and psychosocial trauma. Such an education approach to practice should be aimed at improving evidence-based renal practice. Management team of renal units and renal unit practitioners should enrol for programmes such as the webinar by ISMP (2013:1) “Improving Medication Safety through Staff Education and Competency Assessment: An Important Challenge for Healthcare Organizations” to encourage staff to improve aspects related to patient safety.

Management teams should establish pharmacovigilance units to encourage reporting of incidents without repercussions and provide guidelines on what and how to report pharmacovigilance. Staff who report incidents should be given constructive feedback without blaming. Managers should adopt a culture of non-punitive reporting of adverse effects no matter how negligible, such as bleeding for 15-20 minutes post dialysis including a patient bleeding at home on non-dialysis days, emergency visits to hospital for bleeding episodes and post surgical procedure bleeding. To measure patients’ activated partial thromboplastin time at the bedside staff should be provided with a calibrated point of care testing apparatus instead of waiting for the laboratory to send the results.

This information will make a valuable contribution to the database to evaluate the overall effects of unfractionated heparin experienced by patients and contribute new knowledge on the dangers of UFH. Competitions can be organised for staff to design educational poster and pamphlets for patients, alerting them on the benefits and potential dangers of UFH, thus empowering patients and encouraging their participation in the standard of care delivered.

Study findings should assist renal unit practitioners to critically review their current practice regarding unfractionated heparin and to adopt safe practice measures. Renal unit practitioners’ have the right to reduce their exposure to medical litigation but they have the obligation to deliver good quality renal care. Newly appointed staff should have the right to refuse to administer unfractionated heparin if they feel that they need in-service education on UFH before taking responsibility to administer it. If renal unit practitioners feel doubtful about using

UFH prepared by others they should be allowed to refuse to administer the UFH without repercussions.

It is important for the clinical management team to include the pharmacokinetics of UFH and simulated or problem-based patient management scenarios in the orientation programme. Before new staff administers UFH to a patient, their competency level should be evaluated before and after the orientation. If renal unit practitioners do not pass the predetermined set score, remedial intervention should be part of the in-service education programme. It is also recommended that staff competency tests should be conducted annually. If staff fair poorly, retraining and retesting should be offered to eliminate poor quality practice.

5.6.2 Recommendations for education

Pre- and post-registration nursing education programmes should emphasise medication calculation, pharmacokinetics, pharmacotherapeutics and pharmacodynamic aspects of UFH. Nurses in pre- and post-registration programmes should prove competence in delivering safe quality practice. Life-long learning should be instilled, particularly with regard to updates in medications as these change frequently. Students should be taught how to navigate formulary books and how to do literature searches to enhance their medication knowledge.

5.6.3 Unanswered questions and recommendation for future Research

A question needing further exploration is why UFH in-service education did not occur during the orientation period for the respondents in this study. A possible explanation is that maybe it was a system error as the Unit Managers' may have assumed that since the staff are RNs, CTs and ENs they must have previously received in-service education on the pharmacology of unfractionated heparin. Therefore, during the orientation period there was no interrogation of the staff members' knowledge of UFH.

In relation to checking a new patient's laboratory coagulation results prior to administering unfractionated heparin a minority, 15/77 (19.5%) suggest they "always" do. A question to explore is, do renal unit practitioners consider if a new

patient may have a bleeding disorder when they administer unfractionated heparin to the patient for the first time?

There was an assumption that most would have selected “always” for the questions relating to how often do you inform patients of the potential adverse effects of UFH (17/77; 13.0%) and how to manage adverse effects of UFH (26/77; 33.8%), leaving the researcher speculating why do the respondents not always inform patients of the potential adverse effects of UFH and how to manage the adverse effects.

Thirty-one out of 77 (40.3%) respondents reported “months” as last referencing literature for UFH, while 29.9% (23/77) said it has being years since they last reference literature on UFH and eight out of 77 (10.4%) said “never”. This triggers a question, how do the respondents’ keep up to date with new development on UFH?

From this study, other aspects that are researchable, as not covered in-depth in this study are:

- What characteristics determine if a renal unit practitioner is an expert in the haemodialysis speciality?
- What is the best evidence-base approach to improve renal unit practitioners’ safe medication calculation?
- Does a renal unit practitioner‘s years of experience in the speciality negatively influences critical thinking about the clinical practice area?
- Improving renal patient safety: Open communication between renal unit practitioners and patients regarding different aspects of renal care.
- What factors influence more females to work in haemodialysis?
- What factors contribute to poor mathematical abilities of practitioners?
- Should qualified renal unit practitioners’ that is, the Registered Nurse with a Postgraduate Diploma in Nephrology Nursing be permitted to prescribe and

adjust haemodialysis patients medication and treatment, in the absence of the prescribing doctor?

Nephrology is an evolving speciality. Current literature states 1:8 persons will develop Chronic Kidney disease; therefore, it does not seem as if the patient numbers will decrease especially with an increase in burden of diseases such as Human Immunodeficiency Virus, Diabetes Mellitus Type II and Hypertension. Therefore, the need to conduct more research and the setting of appropriate standards of care practices.

This study can be amended and extended to other renal unit practitioners in South Africa and globally. The evidence those studies will achieve, will support or reject a concern regarding renal unit practitioners KAP on the pharmacological aspects of UFH. This will enlighten the Nephrology practitioner population and bring new evidence to support the adoption of new perspectives for practice that are introduce and implemented in the speciality.

Applying Benner's complete model including the seven domains in a replicated future study may assist renal unit practitioners in developing best practice guidelines.

5.7 CONCLUSION

The primary study objectives were reached by describing in-depth the respondents' self-reported knowledge, attitude and practice concerning the use and effects of UFH. The secondary objective was reached by describing respondents' demographic and professional profiles and determining differences between professional nurses, clinical technologists and enrolled nurses. Sub-objectives were achieved by determining the association between professional categories, years of experience, duration of orientation to the adult chronic haemodialysis unit and in-service education on the pharmacology of UFH on KAP of renal unit practitioners with regard to the use and effects of UFH.

The study showed that renal unit practitioners have inadequate knowledge of the use and effects of UFH, a high alert medication with implications for patient

safety. Benners' model (novice to expert) was not helpful to interpret the data as the novices had knowledge of UFH, possibly attributed to an in-service education on UFH pharmacology, but this study data support Benner's model (novice to expert) that professional category influences knowledge. Additionally, that years of experience of renal unit practitioners influences their use and effects of UFH in clinical practice and that having no in-service on the pharmacology of UFH influences clinical practice.

Taking the limitations of this study into consideration, if adapted for testing in other haemodialysis centres, some of the unanswered questions related to the KAP of renal unit practitioners in relation to UFH may be answered.

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APPENDIX 1: Questionnaire

Participant Code No.:__

QUESTIONNAIRE

A DESCRIPTIVE SURVEY OF RENAL UNIT PRACTITIONERS' KNOWLEDGE, ATTITUDE AND PRACTICE RELATIVE TO THE USE AND EFFECTS OF UNFRACTIONATED HEPARIN IN SELECTED ADULT CHRONIC HAEMODIALYSIS CENTRES IN THE CAPE TOWN METROPOLE

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Faculty of Health Sciences
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Thank you for agreeing to participate in this study. The questionnaire is in English. My details are provided above if you require clarity on any questions. I have an obligation to protect your privacy and anonymity even if you contact me. You may also contact my supervisor or the Human Research Ethics Committee. This is not a test and if you do not know the answers to all the questions, it does not matter.

INSTRUCTIONS

Please follow the instructions above each question section heading and use a pen to complete the questionnaire.

If you make mistakes, you may use correction ink (tippex). If you feel you would like to complete a new questionnaire, kindly contact **XXX** who will provide you with one.

The deadline date for completion is the 19th April 2013. Kindly place the completed questionnaire in the self-sealing envelope and return it to your colleague in charge **XXX**

SECTION A: PERSONAL INFORMATION		
NO.	**DEMOGRAPHIC INFORMATION**	DO NOT WRITE IN THIS BLOCK
001	How old are you? [Age in years] ☐	
	*Choose one response for each item by placing **X** in the relevant box*	
002	What is your gender? [M/F] [01] Male [02] Female	
003	Are you a South African citizen? [01] Yes [02] No [03] If no, state your country of origin and how long you are working in South Africa. _____	
SECTION B: PROFESSIONAL PROFILE		
NO.	**PROFESSIONAL INFORMATION** *Choose the appropriate response by placing **X** in relevant box*	
004	What is your Professional Category? [01] Registered Nurse [02] Clinical Technologist (Nephrology) [03] Enrolled Nurse	

005	Tick one or more box to indicate which of the following qualifications/ training experiences apply to you? [01] Post graduate Diploma in Nephrology Nursing (1 year) [02] Renal Certificate (6 months) [03] Diploma in Critical Care (1 year) [04] Critical Care Certificate (6 months) [05] Diploma in Nephrology Clinical Technology (3 years) [06] Bachelor Technical Degree in Nephrology Clinical Technology (4years) [07] On the job training	
006	*Complete the following question below in your own words.* How many months/ years of experience do you have in an Adult Chronic Haemodialysis Unit? State below: _____	
007	Was a mentor/ buddy assigned to you for orientation when you first started working in an Adult Chronic Haemodialysis Unit? [01] Yes [02] No	
008	What was the duration of your orientation? [ ] Weeks [ ] Months [ ] Not applicable	
009	Have you ever received in-service education on unfractionated heparin pharmacology while working in an Adult Chronic Haemodialysis Unit? [01] Yes [02] No	

SECTION C: KNOWLEDGE REGARDING THE USE AND EFFECTS OF UNFRACTIONATED HEPARIN *Choose **ONE** response for each item by placing **X** in the relevant box*		
010	Patients should always be asked about bleeding tendencies before unfractionated heparin is administered. [01] Yes [02] No	
011	Does unfractionated heparin break down blood clots? [01] Yes [02] No [03] Unsure	
012	A patient has an activated Partial Thromboplastin Time of less than 50 seconds. 5000 international units of unfractionated heparin is administered during the haemodialysis session. Which of the following effects could unfractionated heparin cause? [01] Bleeding [02] Unscheduled Hospitalisation [03] No ill effects [04] Bleeding and unscheduled hospitalisation	
013	A patient arrives for the appointed haemodialysis session. Pre-dialysis the patient is normally mildly hypertensive, with a blood pressure of 140mmHg/95mmHg. Today, the pre dialysis blood pressure systolic reading is 240mmHg and diastolic is 140mmHg. *Would you administer unfractionated heparin?* [01] Yes [02] No [03] Unsure	
014	For which of the following platelet counts would you not administer unfractionated heparin? [01] 420-450 x $10^{9/1}$ [02] 50 -80 x $10^{9/1}$ [03] 150-180 x $10^{9/1}$	

015	A patient has completed a haemodialysis session and supposedly received the prescribed 5000 International Unit of unfractionated heparin during haemodialysis. Twenty minutes later the patient's arterio-venous fistula is still actively bleeding. *Select **ONE** of the following options below to arrest the bleeding*. [01] Protamine sulphate 1 milligram per 100 international unit of unfractionated heparin [02] Protamine sulphate 2 milligrams per 1000 international unit of unfractionated heparin [03] Vitamin K 1milligram [04] Unsure	
	Complete the following questions below in your own words.	
016	Why is unfractionated heparin not administered orally? _____	
017	Why is it important to have the patients' baseline urea values before administering the first dose of unfractionated heparin? _____	
018	State the route of administration of unfractionated heparin in your dialysis centre. _____	
	Complete the following questions below in your own words	
019	What type of unfractionated heparin is used in your dialysis unit? [01] Porcine [02] Bovine [03] Other _____ [04] Unsure	
020	At what temperature should unfractionated heparin be stored? Write the temperature value in degrees Celsius. _____	

021	What effect does unfractionated heparin have on potassium levels? _____	
022	A patient needs to receive 2 000 International Units of unfractionated heparin. Unfractionated heparin in stock is 20 000 International Units per 1ml. The 20 000 International Units of unfractionated heparin is added to 100 millilitres of sodium chlorine 0.9%. Calculate the dose of unfractionated heparin for this patient showing the formula you used. _____	

SECTION D: ATTITUDE REGARDING THE USE AND EFFECTS OF UNFRACTIONATED HEPARIN

023	Patients on haemodialysis receiving unfractionated heparin may experience adverse effects. On a scale of 5 to 1 make a mark to show how you would rank your concerns about these adverse effects for patients receiving unfractionated heparin. **5** indicates great concern and **1** indicates the least concern 1 2 3 4 5 Least Concern Great Concern	
024	*Choose one response for each item by placing **X** in the relevant box*	

	Item	Statement	Strongly Agree **5**	Moderately Agree **4**	Neutral **3**	Moderately Disagree **2**	Strongly Disagree **1**	
	a	It is important to have in-service education for unfractionated heparin pharmacology before taking responsibility for administering the drug to patients						
	b	I feel comfortable administering unfractionated heparin prepared by another staff member						

	c	I feel reporting of adverse effects from the administration of unfractionated heparin will result in punishment						
	d	Adverse effects of unfractionated heparin, are reported in my dialysis centre						
	e	Patients are closely monitored for adverse effects of unfractionated heparin						
024	f	Seeking advice from colleagues regarding uncertainty in dose preparation is treated with ridicule						
025	How often are patients informed of potential adverse effects of unfractionated heparin? [01] Always [02] Sometimes [03] Never							
026	How often are patients informed about how to manage the adverse effects of unfractionated heparin? [01] Always [02] Sometimes [03] Never							

SECTION E: PRACTICE REGARDING THE USE AND EFFECTS OF UNFRACTIONATED HEPARIN *Choose one response for each item by placing **X** in the relevant box*		
027	How often is the unfractionated heparin dose administered as prescribed by the Nephrologist? [01] Always [02] Usually [03] Sometimes [04] Never	
028	How often is a new dialysis patient's laboratory coagulation results checked prior to the administration of the first dose of unfractionated heparin? [01] Always [02] Usually [03] Sometimes [04] Never	
029	How often is a current dialysis patients' laboratory coagulation results checked? [01] Monthly [02] Quarterly [03] Bi-annually [04] Annually [05] Never [06] Other _____	
030	When did you last refer to published literature on unfractionated heparin? State your response below in number of: [01] Days [02] Weeks [03] Months [04] Years [05] Never, state reason _____	

031	When I am concerned about the prescribed dose of unfractionated heparin for a patient I **…** [01] Continue to administer the prescribed dose [02] Verbalise concerns to the Unit Manager [03] Contact the prescribing Doctor [04] Adjust the dosage…***If you gave this response go to Question 032; if not go to Question 033.***	
032	If I adjust the unfractionated heparin dose, I then **...** [01] Document the adjusted dose I administered on patient's records [02] Document only what was prescribed [03] Do not record adjusted dose on patient record [04] Other _____	
033	How long ago did you witness an adverse effect of unfractionated heparin? Please state answer below [01] days [02] weeks [03] months [04] years ago [05] Never, state reason _____	
034	In order of preference, indicate which of the following you will consult for information about unfractionated heparin or other medication used in your adult chronic haemodialysis unit. For example, **1**=most preferred; **4**=least preferred [ ] Nurses [ ] Doctors [ ] Pharmacists [ ] Formulary book	

035	*Choose one response for each item by placing an **x** in the relevant box*						
	Item	Statement	Always 4	Sometimes 3	Usually 2	Never 1	
	a	I ask patients about bleeding tendencies prior to administering unfractionated heparin dose.					
	b	I monitor patients for anaphylactic shock.					
	c	I verify any allergy with patients prior to administering unfractionated heparin.					
	d	I confirm the unfractionated heparin dose with another qualified renal unit practitioner before I administer it.					
	e	I document adverse effects of unfractionated heparin.					
	f	I inform the Unit Manager of patient's adverse effects to unfractionated heparin.					

APPENDIX 2: Information and Consent form

Participant Code No.

INFORMATION AND CONSENT FORM

RESEARCHER'S DETAILS
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Dear colleague

Information Sheet :

I, Debra Ockhuis am a Nephrology Nurse with 23 years experience. I am currently a Master of Science in Nursing Degree student at the University of Cape Town and I am undertaking a study on renal unit practitioners' knowledge, attitude and practice regarding unfractionated heparin. The study has ethical approval from the Faculty of Health Sciences Human Research Ethics Committee (FHS HREC Ref 642/2012 dated 9th January 2013).

Unfractionated heparin is a medication commonly used during haemodialysis to prevent the patients' blood from clotting in the extracorporeal blood circuit. I wish to gain a deeper understanding and knowledge of your viewpoints regarding unfractionated heparin.

Some background information, in 2002, the United Kingdom reported 480 cases of patient harm from the use of anticoagulation therapy and furthermore, in 2006 the National Patient Safety Agency (NPSA) reported about 120 deaths related to anticoagulation usage, of which 23% (28 reports) were associated with the use of heparin. Did you know unfractionated heparin is on the list of the Institute for Safe Medication Practices as one of the nineteen high alert medications?

Reading the abovementioned information directed the development and title of my proposed study, A DESCRIPTIVE SURVEY OF RENAL UNIT PRACTITIONERS' KNOWLEDGE, ATTITUDE AND PRACTICE RELATIVE TO USE AND EFFECTS OF UNFRACTIONATED HEPARIN IN SELECTED ADULT CHRONIC HAEMODIALYSIS CENTRES IN THE CAPE TOWN METROPOLE.

My main purpose of the study is to describe renal unit practitioners' knowledge attitude and practice regarding the use and effects of unfractionated heparin. Secondly, to determine whether there is a relationship between knowledge, attitude and practice and selected variables (category of renal unit practitioner, years of experience, duration of orientation to the adult chronic haemodialysis unit and in-service education on the pharmacology of unfractionated heparin).

From a South African perspective I, as the researcher could find no statistical data on deaths of any adult chronic haemodialysis patients from the Cape Town Metropole that may be relative to UFH usage. The South African Renal Society does not have an active statistical database on current morbidity and mortality of the renal population in South Africa. Interestingly as well, is that I could not find any other such studies in my literature review locally or globally. I believe the findings of my study will inform all renal unit practitioners' locally and globally regarding, how important it is that we take cognizance of employing good medication knowledge, attitude and practice to either improve or sustain our service delivery of quality renal care. This data will be useful for designing in-service training programmes for renal unit practitioners to promote patient safety. This proposed study will attempt to fill this theoretical gap.

Equally important is that when you review the post study findings, your knowledge, attitude and practice (KAP) of unfractionated heparin will hopefully now be base on sound evidence.

Your selection to participate in the study is because you administer unfractionated heparin to your patients on chronic haemodialysis. For this study all renal unit practitioners' who meet the below inclusion criteria from seven purposively selected haemodialysis centres in the Cape Town Metropole will be asked to participate. Namely, Certified Registered nurses who have completed any of the following training programmes such as a Postgraduate Diploma in Nephrology Nursing, a Renal Certificate, a Diploma in Critical Care, a Critical Care Certificate. The Registered Nurses currently study for an additional qualification in any of the specialist area above and including those who are working in

the research settings. The Registered Nurses without additional qualifications as listed above who are working in the selected adult chronic haemodialysis centres. Certified clinical technologists who have a Diploma in Nephrology Clinical Technology (3 years) or a Bachelor's Technical Degree in Nephrology Clinical Technology (4years) or the students on these programmes working in the selected research settings. Enrolled nurses employed in the selected haemodialysis centres. Renal unit practitioners of any gender, age and citizenship meeting the above professional category requirements will be included.

To protect your anonymity the study does not request you to provide your name and surname on the questionnaire. Furthermore, to uphold your confidentiality, anonymity and a non-biased response, I as the researcher will not have direct access to you. Means of communication with you will be through your Unit Manager however, if you wish to contact me, you may do so on the abovementioned details. This same information letter will be used to request permission from your dialysis centres colleagues to participate in the study. They will need to be administering unfractionated heparin and meet the inclusion criteria. The research process is non-invasive, as it does not entail your direct monitoring of administering unfractionated heparin. You can complete the nine page self-administered questionnaire in private, whether in the comfort of your home or at your place of employment. The completing of the questionnaire is a once off process and does not entail you resubmitting. It may take you about an hour to complete the self-administered questionnaire. You will however, need to ensure the delivery of the completed, semi-completed questionnaire or uncompleted questionnaire by the end of the study period (two weeks). You can make a copy of your completed questionnaire so you can compare your responses against the overall study findings.

If you feel undue distress completing the self-administered questionnaire, either contact me directly so I listen to your concerns, clarify your concerns and/or offer reassurance per telephone. Alternatively, you can speak to your Unit Manager who will on your behalf, liaise with me so we can schedule a personal appointment to meet with you to allay your concerns and fears. Remember this is not a test; however, your honest completion of the self-administered questionnaire information will be useful to inform the findings for this study and the designing of any future interventions that needs to be applied. Another factor for you to consider if you decide to participate in completing the questionnaire is that you as an individual will be aware of your own strengths and limitations of your unfractionated heparin knowledge, attitude and practice level when you review the

findings of the published study. I hope that you will feel self-confident that your knowledge of unfractionated heparin you impart to new colleagues in the haemodialysis centres is accurate.

A point worth noting, is that it is not compulsory for you to partake in this study, you have the right to refuse and you may withdraw during the study should you feel you do not wish to participate any further. In no manner will your refusal or withdrawal from the study reflect negatively on you. You will not experience victimization, no explanation is required and there will be no repercussions to be borne by you. If you do decide to participate in the study, you as the study subject are in control of how much information you provide on the questionnaire. However, I extend appreciation, for your honest opinions to validate the study and add credibility.

Your responses are confidential; therefore, I will not disclose your responses to your employer, only to my supervisor and a statistician. I will treat all information submitted justly and there will be no manipulation of information to meet my research outcomes. Storage of the returned questionnaires will be in a steel locked cupboard for a time-period of two years after the study in case post analysis is required to assist in the designing of an in-service training programme and thereafter shredded. There will be no monetary compensation for participating in the study however; I will give acknowledgement for all unidentified participating renal unit practitioners in my dissertation. There is no planned compensation or treatment in the event of injury for this study.

If you are willing to participate in completing the questionnaire, kindly complete the consent form below and return to your manager who will contact me, researcher to collect.

If you participate in the study and are interested in the findings, please do not hesitate to contact my supervisor or me.

If you have any further questions regarding the study, you may contact me, the researcher directly or my supervisor, Dr U Kyriacos. You may also contact the Human Research Ethics Committee for more information about your rights and welfare as a research participant at telephone number 021- 4066626.

THANK YOU FOR YOUR TIME

APPENDIX 2 (continued)

Participant Code No.

CONSENT FORM

University of Cape Town

A DESCRIPTIVE SURVEY OF RENAL UNIT PRACTITIONERS' KNOWLEDGE, ATTITUDE AND PRACTICE RELATIVE TO USE AND EFFECTS OF UNFRACTIONATED HEPARIN IN SELECTED ADULT CHRONIC HAEMODIALYSIS CENTRES IN THE CAPE TOWN METROPOLE.

I_____ have read the provided Information Sheet. I understand what is required of me, as a renal unit practitioner. I have had all my questions answered. I do not feel that I am forced to take part in this study and I am doing so of my own free will. I know that I can withdraw at any time if I wish and that it will have no bad consequences for me.

I hereby give permission for the researcher to keep my completed questionnaire for two years post analysis of the study as per legal requirement.

_____ _____

Date Respondent's Signature

APPENDIX 3: Checklist for Content and Face Validity

Expert Code Number: ……..

CHECKLIST
For Content and Face Validity of the
SELF-ADMINISTERED STRUCTURED QUESTIONNAIRE

Researcher: Debbie Ockhuis
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Title of study: **A descriptive survey of renal unit practitioners' knowledge, attitude and practice relative to use and effects of unfractionated heparin in selected adult chronic haemodialysis centres in the Cape Town Metropole**

INFORMATION:

Thank you for agreeing to evaluate the content and face validity of the self-administered questionnaire (Appendix 1). Please e-mail or post the completed checklist to the researcher at the above address.

The **purpose** of this checklist is to ensure uniform evaluation by all experts using a structured procedure.

You, the expert, will establish the index of content validity (CVI) for each question using a 4-point ordinal rating scale and this will be taken as the proportion of items that received a rating of 3 or 4.[1] If, in your opinion, there are omissions, these can be listed separately.[2]

For evaluation of face validity, the checklist includes a rating scale for quantification of layout, format, quality of printing, the length of the questionnaire, the response scale of 1-4, if visually easy to read and comprehend and if instructions at the beginning of the questionnaire are clear and easy to understand.[2]

Expert opinion on index of content validity (CVI) of EACH QUESTION on the questionnaire:

QUESTION NUMBER	1 = irrelevant	2 = unable to assess relevance without item revision or item is in need of such revision that it would no longer be relevant	3 = relevant but needs minor alteration	4 = extremely relevant
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035a				
035b				
035c				
035d				

QUESTION NUMBER	1 = irrelevant	2 = unable to assess relevance without item revision or item is in need of such revision that it would no longer be relevant	3 = relevant but needs minor alteration	4 = extremely relevant
035e				
035f				

1. Other comments:

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Evaluation of FACE VALIDITY

Please check one box for each statement relating to the questionnaire.

	Very skilful	Satisfactory	Needs improvement	Unacceptable
Layout				
Format				
Quality of printing				
Length of the questionnaire				
If visually easy to read				
If visually easy to comprehend				
If instructions at the beginning of the questionnaire are clear and easy to understand				

Omissions:

Comments:

THANK YOU VERY MUCH

ADAPTED FROM U KYRIACOS, PhD (2011), with permission.

References

1. Lynn, M.R. 1986. Determination and quantification of content validity. Nursing research. 35 (6 November/December): 382-85.
2. Bowling, A., Ebrahim, S., editors. 2007. Handbook of health research methods. Investigation, measurement and analysis. 1st ed. Berkshire, England: Open University Press.
3. Kyriacos, U. 2011. *The development, validation and testing of a vital signs monitoring tool for early identification of deterioration in adult surgical patients [PhD]*. Cape Town: University of Cape Town.

APPENDIX 4: Sample of permission requesting letter

8 Kamp Street
Mabille Park
Kuilsriver
7580

5th November 2012

XXXXX
XXXXX
XXXXX
XXXXX

Dear XXXX

REQUEST FOR PERMISSION TO CONDUCT RESEARCH IN DIALYSIS CENTRE

RESEARCH TOPIC:

A descriptive survey of renal unit practitioners' knowledge, attitude and practice relative to use and effects of unfractionated heparin in selected adult chronic haemodialysis centres in the Cape Town Metropole

I, Debra Jacqueline Ockhuis am presently studying for the Masters in Nursing Degree at the University of Cape Town. Your written approval is requested to conduct research at the _____dialysis centre. Approval has being granted by University of Cape Town Faculty of Health Sciences Human Research Ethics Committee. My ethical clearance number is: _____. Included, please find a copy of my research proposal. The aim of my study is to describe the knowledge, attitude and practice of renal unit practitioners relative to the use and effects of unfractionated heparin in selected adult chronic haemodialysis dialysis centres in the Cape Town Metropole.

Study results may inform the design of in-service training courses to improve renal unit practitioners' standards of practice for safe quality renal care.

If permission is granted, I will ensure that all information regarding renal unit practitioners and their dialysis centre will be treated confidentially. Anonymity will be ensured by not disclosing names of dialysis centres or of respondents. This is not a comparison analysis between private and public dialysis centre. As the employing body, I will ensure that you will receive a copy of the Executive Summary of the completed research. I will comply with legal requirements regarding respondent's rights and confidentiality.

Your positive consideration of granting approval to conduct study at your dialysis centre will be greatly appreciated.

Thank you

Mrs Debra Ockhuis

Student No.: OCKDEB001

APPENDIX 5: Ethical clearance

UNIVERSITY OF CAPE TOWN

Faculty of Health Sciences
Human Research Ethics Committee
Room E52-24 Groote Schuur Hospital Old Main Building
Observatory 7925
Telephone [021] 406 6338 • **Facsimile** [021] 406 6411
e-mail: shuretta.thomas@uct.ac.za

9 January 2013

HREC REF: 642/2012

Ms D Ockhuis
c/o Ms U Kyriacos
Nursing and Midwifery
F45, OMB
Health & Rehab

Dear Ms Ockhuis

PROJECT TITLE: A DESCRIPTIVE SURVEY OF RENAL UNIT PRACTITIONERS' KNOWLEDGE, ATTITUDES AND PRACTICE RELATIVE TO THE USE OF UNFRACTIONATED HEPARIN IN SELECTED ADULT CHRONIC HAEMODIALYSIS CENTRES IN THE CAPE TOWN METROPOLE

Thank you for submitting your study to the Faculty of Health Sciences Human Research Ethics Committee for review.

It is a pleasure to inform you that the HREC has **formally approved** the above-mentioned study.

Approval is granted for one year till the 15th January 2014

Please submit a progress form, using the standardised Annual Report Form if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.
(Forms can be found on our website: www.health.uct.ac.za/research/humanethics/forms)

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Please quote the HREC. REF in all your correspondence.

Yours sincerely

PROFESSOR M BLOCKMAN
CHAIRPERSON, FHS HUMAN ETHICS
Federal Wide Assurance Number: FWA00001637.

Institutional Review Board (IRB) number: IRB00001938
This serves to confirm that the University of Cape Town Human Research Ethics Committee complies to the Ethics Standards for Clinical Research with a new drug in patients, based on the Medical Research Council (MRC-SA), Food and Drug Administration (FDA-USA), International Convention on Harmonisation Good Clinical Practice (ICH GCP) and Declaration of Helsinki guidelines.

s.thomas

APPENDIX 6: Raw data: personal and professional demographics

Raw data captured for Personal and Professional Demographics

subject no.	age 001	gender 002	citizen 003	prof cate 004	qualification 005	exp 006	orientation mentor 007	duration of orientation 008	In-service 009
1	44	2	1	1	7	52	2	3	2
2	39	2	1	1	3	72	2	3	2
3	48	2	1	3	7	108	1	1	1
4	49	2	1	1	7	168	1	2	2
5	52	2	1	1	1; 3	264	1	1	2
6	46	2	1	1	3; 7	60	2	2	2
7	60	2	1	1	1; 3; 7	240	2	2	2
8	23	1	1	2	5	2 ?	1	1	2
9	26	1	1	2	5; 6	38	1	1	1
10	23	1	1	2	5	13	1	3	1
11	33	2	1	2	6	108	1	2	1
12	24	2	1	2	5; 7	2 mths	1	1	2
13	26	2	1	2	6	64	1	2	2
14	28	1	1	2	6	72	1	3	1
15	43	2	1	1	3	48	1	1	2
16	40	2	1	1	7	60	1	3	2
17	49	2	1	3	1001	96	1	1	1
18	1001	2	1	1	7	360	1	2	2
19	23	2	1	2	5	40	1	2	2
20	46	2	1	3	1001	120	2	1	1
21	50	2	1	1	1	60	2	1	2
22	55	2	1	1	7	336	2	3	2
23	50	2	1	1	3	192	2	3	2
24	44	2	1	1	7	228	1	2	1
25	31	1	1	1	3; 7	60	1	1	1
26	49	2	1	1	3	312	1	1	1
27	43	2	1	1	7	156	1	1	1
28	47	1	1	1	3	172	1	2	1
29	38	2	1	1	3	20	1	2	1
30	41	2	1	1	3	19	1	2	2
31	51	2	1	1	1001	240	1	2	1
32	35	2	1	2	6	168	1	1	2
33	44	1	1	2	6	300	1	1	1
34	23	1	1	2	5	24	1	1	1
35	41	2	1	2	5	276	1	3	2
36	55	2	1	1	1	312	2	3	2
37	40	1	1	2	5	180	2	3	2
38	30	1	1	2	5	96	2	3	2
39	55	1	1	2	5	408	2	3	2
40	31	1	1	2	5	96	1	2	1
41	58	2	2	1	3; 7	60	1	1	2
42	1001	2	1	1	7	144	2	3	2
43	38	2	1	1	7	18	1	1	2
44	51	2	1	1	7	5 mths	1	2	2
45	49	2	1	1	1; 3	36	1	2	1
46	35	2	1	3	7	53	2	1	1
47	39	1	1	1	1	76	1	2	1001
48	33	1	1	1	7	36	1	1	2
49	54	2	1	1	7	45	1	1	2
50	33	2	1	1	1	16	1	3	2
51	32	1	1	2	6	96	1	2	1
52	28	2	1	2	6	60	2	4	1
53	42	2	1	1	1	16	2	2	2
54	46	2	1	1	1	36	2	3	1
55	31	2	1	1	1001	2 weeks	1	5	2
56	51	2	1	1	3; 7	6 mths	1	2	2
57	30	2	1	1	7	36	1	1	2
58	25	1	1	2	6	36	1	2	1
59	64	2	1	1	3; 7	360	1	3	2

60	50	2	1	1	7	20	1	1	2
61	1001	1	1	1	7	15	2	2	2
62	38	2	1	2	5	180	1	2	1
63	46	2	1	1	1	132	2	3	1
64	30	2	1	1	7	2 mths	1	3	2
65	41	2	1	1	7	9 mths	1	2	2
66	32	1	2	2	5	48	1	2	2
67	46	2	1	1	7	4 ?	2	3	2
68	24	1	1001	1	1001	4 mths	1	1	1
69	51	2	1	1	7	6 mths	1	2	2
70	52	2	1	1	7	96	1	1	2
71	59	2	1	1	3; 7	360	2	3	1
72	64	2	1	1	7	444	1	2	2
73	48	2	1	1	3	60	1	2	2
74	29	2	2	1	1001	0 ?	1	2	2
75	30	2	1	1	1	24	2	2	2
76	44	2	1	3	7	36	1001	1	1
77	40	2	1	1	1	96	1	2	1

APPENDIX 7: Captured raw data of respondents' knowledge

SECTION C: Raw data analysis of Knowledge

subject no	bleeding tendencies 010	ufh break clots 011	effects of ufh 012	admin ufh 013	not give ufh platelet counts 014	method arrest bleeding 015	ufh not given oral 016	value of baseline urea 017	route of ufh administration 018	type of ufh used 019	temperature storage ufh 020	effects on potassium 021	calculate dose ufh 022
1	1	2	4	1	2	3	not effective	high urea levels cause bleeding	dialysis lines/locking neck lines, femoral lines and perm catheters	1	<25 °C	hyperkalemia	2000 / 20000 x 100 /1 = 10
2	1	2	4	2	2	1	not effective	high urea levels increase bleeding tendency	intravenous	1	below 25 °C	inhibits secretion of aldosterone which may cause hyperkalaemia	dose required / dose on hand x volume / 1 2000 / 20 000 x 100 mls / 1 = 10mls
3	1	2	1	1	2	2	iv to prevent circuit from clotting during dialysis - no oral heparin	patients that's uraemic will dialyse heparin free	5000u stat via heparin line or 5000u stat then 1000u every hr for first 2 hours	3 -heparin 1000u Fresenius	below 25 °C- do not freeze	nil	2000 / 20000 x 100 /1 = 10
4	1	1	4	2	2	1	it cannot be absorbed orally	so that you can decide on the correct dose	intravenously	1	21 °C	no effect	dose required / amount in stock x volume / 1 2000 / 20 000 x 100 mls / 1 = 10mls
5	1	2	3	2	2	2	only for intravenous use	an increase in urea values predispose patient to bleed	intravenously	1	below 25 °C	causes hyperkalemia	dose required /dosage in stock x ml / 1 2000 / 20 000 x 1 /1 = 0.1ml

6	1	1	4	2	2	1	metabolised via liver, excreted via kidneys	risk of bleeding	intravenously	1001	1001	I don't know	2000 / 20 000 x 100 / 1 = 10 mls
7	1	2	1	2	2	1	it is not absorbed by the gut	high urea levels cause bleeding	intravenously	1	below 25°C	increase levels	dose required / dose in stock x volume 2000 / 20 000 x100 =10mls
8	1	2	1	2	2	2	it can affect the internal organs	1001	iv through the machine blood lines	2	less than 24°C	not sure	2000 =? 20 000 = 100ml =10ml
9	1	2	3	3	2	4	can cause gastrointestinal bleeding	high levels of urea in blood is associated with bleeding	heparin infusion ,manually IV	4	less than 3°C	1001	1ml (solution) = 2 00 00 / 100 =200IU 200 x 10 =2000IU 10ml =2000IU
10	1	2	1	2	2	2	to anticoagulate the extracorporeal circuit and not cause internal bleeding	high urea values can interfer with heparin side effects	through the arterial sample port with a needle and syringe	4	32 °C	1001	20 000IU/ml / 100ml sodIUm chloride = 2000IU heparin /ml
11	1	1	1	2	3	1	it will take long to be dialysed into body	to check after how long pt will clot ACT	heparin line of blood lines	1001	less than 25 °C	hyperkalaemia	1001
12	1	2	4	1001	1001	1	it is not absorbed through the gastrointestinal mucosa	1001	administration of initial bolus then give repeated bolus every hour	1001	1001	may use hyperkalaemia because it suppress the aldosterone synthesis since it has be speculated that aldosterone may assist in potasslUm excretion	20000 / 2000 x 100 /1 = 10mls = 100
13	1	2	4	2	2	2	can cause internal bleeding	higher urea levels , higher the bleeding	IV	1	< 25 °C	hyperkalaemia	2000 / 20 000 x 100 / 1 = 20 / 2 = 10mls

14	1	2	1	2	2	2	because it can cause internal bleeding	1001	through the extra coporeal circuit	4	23 °C	increase K+ levels	1001
15	1	1	4	2	2	1	because orally the absorption take much longer	the higher the urea levels the prone the patient is prone to bleeding	intravenous	1	less than 28%	it cause hperkalemia because it stops the production of aldosterone	2000 / 20 000 x 100 /10 = 20 /2 =10mls
16	1	2	1	2	3	2	oral not available/also it is for the dialysis	pt can bleed	ivi via dialysis lines	2	? Patient temp	increases potasslUm	DB / DV X Vol /1 =10ml
17	1	1	1001	2	2	2	1001	1001	given as a bolus dose via machine	1001	room temperature	none	1001
18	1	1001	1	2	1	1	iv or subcut use only	increase urea level can cause bleeding gastritis	intravenous	1	<25 °C	nil	dose required / dose in stock x volume 2000 / 20 000 x100 /1 =10
19	1001	2	1001	2	2	2	cause unfractionated heparin can cause internal bleeding	high urea levels increse bleeding	iv	4	<25 °C	hyperkalaemia	2000/ 20 000 x 100 / 1 = 20/ 2 = 10mls
20	1	2	1	2	2	2	1001	1001	bolus via the machine	1	room temperature	increased potasslUm	1001
21	1	1	4	2	2	3	the absorption is not effective	1001	intravenous	1	below 35 °C	1001	2000 / 20 000 x 100ml N Saline = 200 / 20 = 10ml
22	1	1	3	2	2	4	for use to prevent arterial and ven trombos	urea levels very high - patient can bleed	give a start dose of +/- 2000 units and then hourly 500u or 1000u for the following 2 hours through the heparin line	3 - Heparin SodlUm FresenlUs 1000 i.u /ml & 5000 i.u./ml	room temperature ↓25°C	inhibits the secretion of aldosterone which may cause hyperkalemia if patients known for hyperkalemia	SB /SV x 100/ 1 2000 / 20 000 x 100 / 1 = 5mls

23	1	2	3	2	2	1	only available intravenously	can instigate bleeding high urea	through dialysis machine	4	room temperature 21°C	increases potasslUm	2000 / 20 000 x 100 / 1 01 ml
24	1	1	3	2	1001	4	it is an ivi therapy	to prevent uncontrolled bleeding	ivi	3	room temperature	non	2000 / 20 000 x 1 / 100 = 100
25	1	2	4	2	2	2	it is widely used as an injectable anticoagulant	high urea levels has an indication for bleeding	ivi via haemodialysis machine	3 - FresenlUs	room temperature	it increase potasslUm level (hyperkalemia	stock needed / stock available x volume / 1 = 2000 / 20 000 x 100 / 1 = 10ml
26	1	2	4	2	2	2	it is an injectable anticoagulant	high urea leads to bleeding	ivi via haemodialysis machine	1	room temperature	hyperkalaemia	stock needed / stock available x volume / 1 = 2000 / 20 000 x 100 / 1 = 10ml
27	1	2	4	2	2	2	because it can used as a injectable anticoagulant	high urea levels cause bleeding	intravenous via hemodialysis machine	1	below 25°C room temperature	it cause hypercalemia	stock needed / stock available x volume / 1 = 2000 / 20 000 x 100 / 1 = 10ml
28	1	1	1	2	2	2	it is not effective after oral administration	if urea is high and you give heparin it can cause bleeding	intravenously	1	store below 25°C Do not freeze	it can cause hyperkalaemia	20 000 x 100 ml = 20 000u / 2000 = 1000u
29	1	1	4	2	2	2	it is an iv drug	hyperuremia can also increase bleeding risk and bleeding time	via dialysis line pre dialyser	3 - Bodene	below 25°C ,not to be freezed	none	dose required / dose available x volume in wich diluted / 1 = 2000 u/ 20 000 u x 100 ml/ 1 = 10ml 10ml = 2000u heparin
30	1	1	3	2	2	4	it comes in intravenous injection only	high urea can cause bleeding	intravenous hourly	3 - Heparin SodlUm	21°C room temperature	none	20 000IU 100m of Na CL 0.9% . Therefore in 1 ml 20000 / 100 therefore 200 I u per ml. You give 2000 / 200 = 10 ml 10 ml is given to the patient

31	1	1	1	2	1001	3	it is evenly distributed between cells and plasma and is well absorbed	1001	haemodialysis machine	1	below 25°C	hyperkalaemia may occur	2000 / 20 000 x 100 / 1 10ml
32	1	2	1	2	2	1	it is not absorbed by gut	urea levels too high there will be high risk of bleeding	via the heparin line on the arterial blood line	1	below 25°C	may cause hyperkalaemia	20 000IU/ml /100ml NaCl = 200 IU/ml 2000IU /200IU/ml = 10 ml therefore 10 ml of heparinised (20 000IU) 100ml/0.9%Na Cl = 2000IU
33	1	2	4	2	2	1	heparin is not absorbed from the gut	high urea levels increase bleeding risk	intravenously via arterial line of extra corporeal circuit	1	<25°C	hyperkalemia due to decreased secretion of aldosterone	10ml 20 000IU/ 100ml NaCl = 2000 IU/ml 2000IU/200IU/ml = 10ml
34	1	2	4	2	2	4	will be destroyed by stomach acid	↑urea level increase chance of bleeding	via heparin line on extra corporeal circuit	2	> 20°C	1001	total 10millileters given
35	1	3	4	2	2	4	1001	↑urea ↑ bleeding	iv	4	↓25°C	unsure	10ml
36	1	1	1	2	3	4	intravenous drug	ureamia causes bleeding	on dialysis continuous	1	below 25°C	nil	2000 / 20 000 x 100 / 1 =10ml
37	1	2	1	2	3	4	ivi	? Unsure	ivi	1	25	none	unsure
38	1	2	1	2	3	3	unsure	ureamia causes bleeding	continuous	1	- 25°C	unsure	2000 / 20 000 x 100 / 1 = 10ml
39	1	1	1	1	1001	4	not manufactured as such	to determine post dialysis bleeding	200u as loading 1000u / hr to end of dialysis	2	room temp 22°C	unsure	10ml
40	2	1	1	2	2	4	it is only indicated for iv use	high urea - bleeding tendency because of toxins	intravenous	4	room temperature (5 - 25 °C) but away from direct	not sure	20 000 u/ 100ml = 2000u / x 100ml x 2000 = 20000x 2 00 000 / 20 000 = 20000x / x x=10mls

											sunlight		
41	1	2	1	2	2	1	the body digest it before it can be used	with high ureas patients bleed more	5000 heparin in 20mls subfluid (25mls) bolus 5 mls iv	3 sodium heparin	at room temperature	can increase it	2000 / 20 000 x 100 / 1 = 1000u
42	1	2	1	1	2	3	Haven't ever heard of oral heparin	1001	iv	1	below 25°C	1001	2000 / 20 000 x 100 / 1 = 10ml
43	1	2	4	3	3	1	only indicated for iv, cannot be absorbed in the gut.	high urea predispose to bleeding	iv	1	5-25 °C	increased potassium levels	20 000 = 2000 100ml = xml 100 x2000 / 20 000n= 20000/20000 = 10mls
44	1	1	1	2	2	1	it gets digested before being used for its purpose	high urea values make patients bleed more	intravenously	3 sodium heparin	room temperature (2 - 8 °C	increases potassium levels	2000 / 20 000 x 100 / 1 = 1000u
45	1	2	4	2	2	3	heparin contains sodIUm iv therapy	urea tendencies for bleeding	intravenously	1	- 25 °C	hyperkalemia due to aldosterone suppression	2000 / 20000 x 100 / 1 = 10mls
46	1	2	1	2	2	1	absorbed faster intravenously	increase urea ; increase bleeding	intravenous	3	40 °C room temperature	increases potassium levels	2000 / 20 000 x 100 / 1
47	1	1	1	2	2	2	1001	1001	iv	2	<25>0	1001	2000 / 20 000 x 100 / 1 = 100ml of prepared solution dose needed / dose in stock x volume for preparation / 1
48	1	1	4	2	2	3	because it is short acting	1001	ivi	4	room temp 21°C	don't know	2000 / 100 x 1 / 1 200 units / 1 ml 2000 x 10 = 2000 = 10 ml

49	1	1	4	2	2	3	does not get absorbed by gut system	1001	iv in 30ml syringe in driver of 5008	Bodene	below 25°C	raises it	1ml = 20 000 units + 99mls Na Cl0.9% + 1ml Heparin = 100ml Na Cl 0.9% + 20 000 units Heparin therefore 10ml NaCL 0.9% with 2000u heparin therefore give pt 10ml for 2000 units
50	1	1	1	2	1	1	1001	1001	ivi	4	room temp	1001	dose req / dose stock x vol / 1 2000 / 20 000 x 1 /1 = 0.1 x 100ml NaCl = 10 ml heparin mixed with Na Cl
51	1	1	4	2	2	2	it is not absorbed in the GIT	high urea levels can lead to bleeding	iv	2	36°C -38°C	increase K+	draw 1 ml out of 100 ml saline. Insert 1ml 20 000 hep 100 ml = 20 0000 units 10ml = 2000 units
52	1	2	4	2	2	2	works primarily in blood clotting cascade and could be aangeraise in the digestive system	will cause thinning in the blood , could cause excessive bleeding	intravenously (catheter or AVF) passes through the blood (external) circuit before going to the patient	1	25°C	could increase serum levels	20 000u 100ml / 200u /ml 2000 / 200 = 10ml
53	1	2	3	2	2	3	1001	it is good to know the patient baseline values before administering heparin	iv	2	room temperature 35°C	not sure	DR / DS X ML /1 =2000 / 20 000 X 1 / 1 =10ml
54	1	2	3	2	2	1	wont be absorbed in the gut	unsure	intravenously	2	1001	nil	2000 / 20 000 x 100 / 1 = 10mls = 2000IU
55	1	1	1	2	1	4	cannot be absorbed by gastro intestinal tract	unsure	iv	unsure	21 - 25°C	1001	dosage required / dosage in stock x volume / 1 2000 / 20 000 x 100 ml / 1 = 10 ml

56	1	2	1	1	1	1	company issued it as used per injection only, it also needs to be absorbed stat	elevated urea can already lead to bleeding itself	prescribed dosage mixed in Na Cl 0.9 % connected to prescribed port , which leads to red (arterial) side , = pre filter	1	room temperature =/- 18 - 20°C	may elevate potassium levels	dosage needed / dosage in stock x volume / 1 2000 / 20 000 x 100ml / 1 = 10 000IU
57	1	2	1	2	2	1	it is not absorbed by the gut	1001	intravenous	2	1001	it increase the potassium level	20 000 / 100 = 200 / ml 2000/200 = 10mls
58	1	2	4	2	2	2	glycosaminoglycan molecule that is digested by enzyme and HCL	urea affects clotting time (↑ urea = ↑ clotting time)	bolus + infusion continuously via arterial line before dialyser	1	room temperature(25° or less)	1001	20000/10ml=200u/ml=10ml of 200u/ml heparin
59	1	2	3	2	2	2	can cause local bleeding	high urea levels has a bleeding tendency	via heparin line on A- line of dialysis	1	below 25°C	inhibits the secretion of aldosterone which may cause hyperkalemia	2000 / 20000 x 100/1 200 / 2000 10ml needed from 100ml dilution
60	1	1	1	2	2	1	not oral preparation - gastric bleeding	unsure	ivi	4	room temp 23°	unsure	only use 1000 in 1ml or 5000u in 1ml 20 000 / 100 20 000 in 100ml - 200u in 1ml use 10ml for 2000 u
61	1	2	1	3	2	1	not absorbed via GI Tract	excessive bleeding as a result of elevated urea	intravenous	2	21 - 25°C	1001	volume required / volume in stock = dose required / dose in stock volume req = dose req / dose in stock x vol in stock 2000 / 20000 x100 = 10ml
62	1	2	1	1001	1001	1001	1001	1001	1001	2	store below 25 °C but do not freeze	can increase K+	20 000 / 100 200 X 10 / 1 X10 = 2000 / 10 give 10ml of solution

63	1	2	3	2	2	1	it does not get digested by GIT. It should be administered ivi to do its work	a high urea value cause bleeding tendency	ivi via dialysis line pre dialyser	1	under 25°C	it increases it slightly	2000 / 20000 x 100 /1 = 10ml
64	1	2	1001	2	2	3	it will not have any effect, it will not be absorbed	↑urea will already affect clotting actively	intravenous	4	room temperature 25°C	unsure	dose required / dose in stock x volume / 1 2000 / 20 000 x 100 / 1 200 / 20 10ml
65	1	1	1	3	3	1	unsure	to check platelet count	intravenously	1	room temperature	not sure	dose required / dose in stock x v /1 2ml
66	1	2	1	2	2	1	would be broken down	1001	iv	2	20 - 25	1001	20 - 100ml 2x 100 / 20 = 10mls
67	1	2	1	2	2	4	no absorption	lead to increase bleeding due to platelet dysfunction	extra corporeal iv	1,2	below 25°C	hyperkalemia	20 000 heparin in 100ml saline 200 u / ml 10ml
68	1	1	1	2	2	4	because it works on the blood	Unsure	ivi	4	1001	unsure	1001
69	1	1	4	1	2	4	not an oral drug	1001	intravenous	2	room temperature =+/- 20°C	nil	10mls
70	1	2	1	2	2	4	poor absorption	to prevent bleeding	iv	3 - both of the above	22°C	causes potassium shift	required amount / amount in stock x volume =2000 / 20 000 x 100 = 10u
71	1	1	3	2	2	1	designed for iv	prevent bleeding	iv	1001	below 25°C	1001	strength required / strength in stock x volume
72	1	1	3	1	2	1	ivi only	for bleeding	ivi	2	21°C	none	1001

73	1	1	3	2	2	1	you don't get oral heparin	prevent bleeding	ivi	2	21°C room temperature	unknown	dose required / dose in stock x volume / 1 2000 x 10 / 20 000 =1 ml
74	1	2	1	3	2	2	because it is not to be absorbed in the gut	it is because heparin increases the level of urea	iv	2	1001	1001	dose required in units x available drug dose in mls / available dose in units = 2000 x 101 / 20 000 =202 000 / 20000 =10.1mls
75	1	1	1	2	2	1	because of time it would take to be active and can cause bleeding ulcers	to ensure complications eg	ivi	3 - mucosal	1001	increases levels	1001
76	1	3	1001	1001	1001	1001	1001	1001	via machine in 30ml syringe	1001	1001	1001	1001
77	1	2	4	2	2	1	1001	high urea - cause blood to be thin and can lead to bleeding	ivi	4	36.5°C	1001	dose required / dose in stock x vol / 1 2000 / 20 000 x 100 / 1 = 10

APPENDIX 8: Captured raw data of respondents' attitude

Section D: Raw data analysis Attitude

subject no.	rank adverse effect for pt receiving ufh 023	inservice importance 024a	administering dose prepared by other 024b	reporting adverse effects punitive 024c	adverse effects always reported 024d	close monitoring for ufh 024e	seek colleagues advice about ufh dosing 024f	informing patients re potential ufh adverse effects 025	inform patient management of adverse effect ufh 026
1	5	5	3	1	5	3	5	3	3
2	4	5	1	1	5	4	1	2	1
3	2	5	1	1	2	2	1	1	2
4	1001	5	4	1	5	5	1	2	1
5	5	4	4	1	4	4	1	2	2
6	3	5	4	1	5	5	1	3	2
7	4	5	1001	1	4	4	1	2	2
8	5	5	3	3	2	5	3	2	2
9	1	5	3	1	4	4	1	2	2
10	5	5	3	1	2	5	1	1	1
11	1001	4	1	1	4	5	4	2	1
12	2	4	3	2	4	3	1	2	2
13	5	5	5	1	5	5	1	2	2
14	5	5	3	2	5	5	4	2	2
15	3	5	4	2	5	5	3	1	1
16	4	4	5	1	3	3	3	2	1
17	1001	5	4	5	3	5	3	1	1
18	5	5	1	1	5	5	1001	2	1
19	5	5	3	1	5	3	3	2	2
20	3	5	4	3	5	4	3	1	1
21	5	5	1	1	5	5	1	2	2
22	4	5	1	4	5	5	1	1	1
23	3	5	1	3	4	4	4	2	2
24	1001	5	1	1	5	5	5	1001	1

25	3	5	1	1	5	4	5	1	1
26	3	5	1	1	5	5	5	1	1
27	3	5	1	1	5	5	5	1	1
28	4	5	1	1	5	5	5	1	1
29	5	5	1 - if she didn't mixed in front of me	5	5	5	1	1	1
30	3	5	1	1	5	5	1	2	1
31	5	5	4	3	5	5	1	2	1
32	3	4	3	2	3	4	2	2	2
33	4	5	1	3	4	4	2	3	2
34	4	4	3	3	2	3	3	2	2
35	1001	5	2	2	4	4	1	2	2
36	5	5	1	1	5	4	3	3	2
37	5	5	1	2	5	3	1	1	1
38	4	5	1	3	5	3	1	2	3
39	3	4	4	4	2	3	2	2	2
40	3	4	1	3	4	4	3	2	2
41	4	5	4	1	5	5	1	2	2
42	5	5	4	1	3	5	5	2	2
43	2	5	2	1	1	1	1	3	3
44	4	5	1	5	5	5	1	2	2
45	5	1001	1001	1001	1001	1001	1001	1001	1
46	5	5	1	1	5	5	1	1	1
47	4	5	3	1	5	4	1	2	1
48	3	5	1	2	1	5	1	2	3
49	1001	5	2	3	4	4	3	2	2
50	3	5	3	2	4	3	4	2	2
51	3	5	4	3	3	4	2	2	2
52	4	5	3	1	3	2	3	2	3
53	5	5	1	1	5	4	5	2	3
54	4	5	1	2	4	3	5	2	2
55	1001	5	1	1	1001	5	1	2	1001
56	2	5	1	4	5	5	1	1	1
57	5	5	3	1	3	4	1	2	2
58	4	5	1	2	4	4	2	2	2
59	3	5	1	1	4	5	1001	2	2
60	3	5	4	1	4	3	1	2	2
61	4	5	1	2	2	2	1	3	3
62	2	3	3	2	3	3	1	2	2
63	1001	5	1	1	5	5	5	1	1

64	5	5	1	4	3	1	5	3	2
65	3	5	2	3	5	5	5	2	2
66	3	5	2	2	3	3	2	2	2
67	2	5	1	1	5	5	1	2	2
68	4	1001	1001	1001	1001	1001	1001	1001	1001
69	4	5	1	1	3	4	1	2	2
70	5	5	1	1	3	3	2	2	3
71	3	5	1	1	5	5	1	1	1
72	3	5	5	3	5	5	5	2	2
73	3	5	1	2	5	5	5	1	2
74	4	5	1	3	3	5	1	2	2
75	1001	1001	1001	1001	1001	1001	1001	1001	1001
76	1001	5	1	1001	1001	4	5	1001	1
77	4	5	2	1	4	2	2	2	2

APPENDIX 9: Captured raw data of respondents' practice

SECTION E: Raw data analysis Practice

subject no.	administering prescribed dose 027	checking new pt lab coag studies 028	checking current patients coagulant studies 029	referring to published literature on heparin 030	practice regarding concern prescribed dose 031	practice regarding self adjust dose 032	witness of reaction to ufh 033	preference of consulting 034	pt bleeding tendency prior to administering ufh 035a	monitoring for anaphylactic shock 035b	verifying allergy prior to administering ufh 035c	confirming dose with another person 035d	document adverse reactions 035e	inform unit manager of patient adverse reaction 035f
1	2	4	2	4	2	1	3	2,1,4,3	1	1	1	2	2	2
2	2	3	6- when necessary i.e. if pt has prolonged bleeding times or symptomatic c/o hair loss, haematuria,petechia or if going for surgery	2	4	1 and 4 -inform dr concerned	1	1,2,4,3	3	4	1	1	4	4
3	1	3	2	3	3	1	1	doctors	3	3	3	4	4	4
4	1	1	2	5 -did not see the reason why	3		3	2,1,3,4	4	3	4	3	4	4

5	2	3	2	1	3	1	3	2,1,3,4	3	2	3	2	4	4
6	1	4	2	4	3	1	3	pharmacist	4	4	4	4	4	3
7	1	3	6 - when necessary	4	3		2	3,1,4,2	3	3	4	3	4	4
8	1	2	2	3	2	1	5 - I seldom experience it	3,4,3,3	4	3	3	4	4	4
9	1	2	2	4	3		1	1,2	2	2	1	2	2	3
10	4	2	4	2	2		3	3,2,4,1	3	4	4	4	4	4
11	1	2	1	3	3	1	3	doctors	2	4	1	2	4	2
12	1	1001	2	1	1001	1001	2	4,3,3	3	2	3	4	1001	1001
13	1	1	6 - 3 monthly	3	3		1	4,1,2,3	4	3	4	4	4	4
14	1	2	2	2	3	1	3	3,2,1,4	3	4	3	4	4	4
15	2	3	2	4	3	1	1	4,2,1,3	3	4	3	3	4	4
16	3	1	2	4	3	1	don't remember	doctors	4	3	3	4	4	4
17	1	1	6- every 3 months	4	2	1	5	doctors	4	4	4	4	1001	4

18	2	3	2	3	3	1	3	4,1,2,3	3	3	3	4	4	4
19	1	4	5	5 -never came across an article	2		1001	2,3,4,1	3	1	1	3	4	4
20	1	1001	6- on request /every 3 months	3	2		3	4,2,1,3	4	4	4	4	4	4
21	1	1	2	2	2	1	3	3,1,2,4	4	4	4	4	4	4
22	1	1	1 and 6 - after post op checked results before start dialysis	3	3		4	doctors	4	4	4	4	4	4
23	3	3	6	3	3	1	3	doctors	3	4	4	3	4	3
24	1	3	1 and 6 - when dosages change	5	3	1	5	4-doctors	4	4	4	4	4	4
25	1	1	6 - only when patients are on warfarin	3	3	1	4	2,4,1,3	4	4	4	4	4	4
26	1	1	6 - only when patients are on warfarin	3	3	1	4	3,1,2,4	4	4	4	4	4	4
27	1	1	6 - only when patients are on warfarin	3	3	1	4	3,1,2,4	4	4	4	4	4	4
28	1	1	1	3	3	1	3	2,1,3,4	4	4	4	4	4	3

29	1	1	1 patients on warfarin and 6 - when patients have bleeding/ infection	3	2		3	formulary book	4	4	4	4	4	4
30	4	4	6 - just when they on warfarin or going to theatre	3	4	1	3 - patient when for gastroscopy and heparin was administered for dialysis, patient developed gastro - intestinal bleeding	4,2,1,3	1	4	1	4	4	4
31	1	3	1	3	2	2	3	doctors	3	4	3	4	4	4
32	2	4	6 When necessary	3	4	1	4	1,2,4,3	3	3	1	4	4	4
33	2	2	1	3	4	1	2	3,1,2,4	3	3	1	4	4	3
34	2	3	1	3	4	1	3	1,2,3,4	3	4	3	3	4	3
35	4	4	6 not sure	5	2,3	1	4	1001	3	3	3	3	4	4
36	1	3	2	4	3	1	5	doctors	3	4	2	2	4	4

37	2	3	2	4	3	1	5	3,1,2,4	3	2	4	4	2	4
38	1	3	2	4	3	1	5	4,1,2,3	3	3	4	4	4	4
39	1	4	6 - warfarin	5	2	1	4	nurses	3	3	4	4	4	4
40	1	1	1	4	2	3	3	3,1,2,4	1	2	2	3	4	4
41	2	2	6 - only when indicated with the co-morbidities e.g warfarin	1	2	1	4	2,1,2,2	4	4	4	3	4	4
42	2	2	6 - 3 monthly	3	2	1	2	2,1,4,3	4	4	4	3	4	4
43	3	4	4	2	2	1	5- unaware of side effects of heparin	4,1,2,3	2	2	2	3	1	1
44	2	3	6- when indicated with other co-morbidity	3	2		4	1,3,4,2	4	1	4	2	4	4
45	2	2	1	1	3	1 and 4 on pts on plavix	1	doctors	4	4	4	3	4	4
46	1	3	6	4	3	4- not to be adjusted	5	pharmacists	4	4	4	4	4	4
47	1	4	5	3	3		2	3,2,4,1	4	4	4	4	4	4

48	1	2	1	4	1	1	4	4,2,3,1	3	4	3	4	4	4
49	2	4	5	1	3		3	pharmacists	4	4	4	4	4	4
50	2	3	4	3	2		5	3,1,4,2	3	4	4	2	2	4
51	3	3	2	3	2	1	3	2,1,3,4	3	4	4	4	3	4
52	1	3	5	3	3	1	2	4,2,1,4	3 -new patients	4	3	3	4	4
53	1	2	5	3	3	1	5-there was never in incident that I saw in the unit	4,2,3,1	4	3	4	4	4	4
54	1	4	6 - depends on whether they are using warfarin or other types of anticoagulants	3	3		2	4,1,2,3	3	4	2	2	2	2
55	1	unsure	6 - don't know	5 - never used it	3		5 -new in unit	4,3,2,1	1001	1001	1001	1001	1001	1001
56	1	3	6 - only if the patient is using warfarin for ? Atrial fibrillation or due to DVT	4	2 and 3	1	2	4,3,1,2	4	4	4	4	4	4
57	1	2	5	4	3	1	3	3,2,4,1	3	4	4	4	4	4

58	1	4	6 - if requested	3	3		3	4,1,2,3	3	4	3	3	4	4
59	1	3	6 - when bleeding problems	5	4	1	5	4,1,2,3	3	4	4	3	4	4
60	1	4	6 - unsure	4	2		3	1,2,3,4	3	2	3	3	2	4
61	1	3	5	2	2	1	5 - I have not witnessed it yet	2,1,4,3	3	4	1	2	1001	1001
62	1	3	5	3	2	1	5 - prolonged bleeding incidents that I have witnessed was caused by other factors than heparin dosage	4,3,1,2	3	4	3	4	4	4
63	1	3	6 - only when needed if there is a bleeding tendency. We evaluate the patients fisically	4	2,3,4	1	3	4,2,3,1	3	4	1	4	4	4
64	2	1	6 - unsure	2	2		2	2,3,4,1	1	1	1	2	1	2
65	1	3	1	1001	2	1	3	1001	4	3	4	4	3	1001
66	1	3	5	3	2		3 - profuse bleeding	4,1,2,3	2	1	1	1	2	4

67	1	3	6 - if asked by Dr	4	2		5 - quality care	4,2,1,3	4	4	3	3	4	4
68	1001	1001	1001	4	3	1	1	pharmacists, formulary book	4	3	3	3	2	3
69	2	1	2	4	2	1	4	1,4,4,1	2	2	3	2	4	4
70	3	3	1	5	3	(4) write ordered dose, then doctor to sign	3	2,3,4,1	3	1	1	3	4	3
71	4	3	2	3	3	(4)consult before adjust	1	4,3,1,2	4	4	4	4	4	4
72	1	4	5	4	3	1	4	4,3,1,2	4	4	4	4	4	4
73	1	4	5	4	3	1	4	4,3,1,2	4	4	4	4	4	4
74	1	4	5	1	1001	1001	1001	pharmacist	2	2	3	4	3	4
75	1001	2	2	4	4	1	2- perfused bleeding AVF	2,1,3,2	4- for 1st time	4 for 1st session	4 for 1st session	4 for 1st session	4	4 – and inform the doctor
76	1	1	1	1001	3	1	1001	doctors	4	4	4	4	4	4
77	1	4	5	3	3	1	2	4,2,3,1	3	3	3	3	4	4

APPENDIX 10: Pilot study data - answer sheet for questionnaire

Recoding (reversal of mark allocation per response) of questionnaire and answer sheet

SECTION C: KNOWLEDGE REGARDING THE USE AND EFFECTS OF UNFRACTIONATED HEPARIN *Choose **ONE** response for each item by placing **X** in the relevant box*		
010	Patients should always be asked about bleeding tendencies before unfractionated heparin is administered. **[1] Yes** [0] No *(Pittard, 2001:75)*	**1**
011	Does unfractionated heparin break down blood clots? [0] Yes **[1] No** [0] Unsure *(Pittard, 2001:75; Lankshear et al., 2010:48)*	**1**
012	A patient has an activated Partial Thromboplastin Time of less than 50 seconds. 5000 international units of unfractionated heparin is administered during the haemodialysis session. Which of the following effects could unfractionated heparin cause? [3] Bleeding [2] Unscheduled Hospitalisation [1] No ill effects **[4] Bleeding and unscheduled hospitalisation** *(Pittard, 2001:74)*	**4**
013	A patient arrives for the appointed haemodialysis session. Pre-dialysis the patient is normally mildly hypertensive, with a blood pressure of 140mmHg/95mmHg. Today, the pre dialysis blood pressure systolic reading is 240mmHg and diastolic is 140mmHg. *Would you administer unfractionated heparin?* [0] Yes **[1] No**	**1**

	[0] Unsure *(Lankshear et al., 2010:49)*	
014	Which of the following platelet counts would you not administer unfractionated heparin? [0] 420-450 x $10^{9/1}$ **[1] 50 -80 x $10^{9/1}$** [0] 150-180 x $10^{9/1}$ *(Baglin et.al., 2006:28; Lankshear et al., 2010:49)*	**1**
015	A patient has completed a haemodialysis session and supposedly received the prescribed 5000 International Unit of unfractionated heparin during haemodialysis. Twenty minutes later the patient's arterio-venous fistula is still actively bleeding. *Select **ONE** of the following options below to arrest the bleeding*. **[1] Protamine sulphate 1 milligram per 100 international unit of unfractionated heparin** [0] Protamine sulphate 2 milligrams per 1000 international unit of unfractionated heparin [0] Vitamin K 1milligram [0] Unsure *(European Best Practice Guidelines Expert Group on Haemodialysis 2002:65; Baglin et al., 2006:28; Lankshear et al., 2010:51)*	**1**
	Complete the following questions below in your own words.	
016	Why is unfractionated heparin not administered orally? **[1] Destroyed by stomach acids** [0] All other answers *(Lee et al., 2001:3116)*	**1**
017	Why is it important to have the patients' baseline urea values before administering the first dose of unfractionated heparin? **[1] Bleeding risk** [0] All other answers *(Pittard, 2001:75)*	**1**

018	State the route of administration of unfractionated heparin in your dialysis centre. [1] Bolus dose [2] IVI **[3] continuous via dialysis machine** All above acceptable, but **[3]** preferred *(De Vos et al., 2000:21; SARS, 2006:8)*	**3**
	Complete the following questions below in your own words	
019	What type of unfractionated heparin is used in your dialysis unit? **[1] Porcine** [0] Bovine [0] Other _____ [0] Unsure *(Shen et al.,2012:474)*	**1**
020	At what temperature should unfractionated heparin be stored? Write the temperature value in degrees Celsius. **[1] < 25 degrees celsius** [0] All other answers *(Bodene, 2008)*	**1**
021	What effect does unfractionated heparin have on potassium levels? **[1] Inhibits the secretion of aldosterone - hyperkalaemia** **[1] Hyperkalaemia** [0] All other answers *(Lankshear et al., 2010:51; AHRQ, 2011:5)*	**1**
022	A patient needs to receive 2 000 International Units of unfractionated heparin. Unfractionated heparin in stock is 20 000 International Units per 1ml. The 20 000 International Units of unfractionated heparin is added to 100 millilitres of sodium chlorine 0.9%. Calculate the dose of unfractionated heparin for this patient showing the formula you used. **[1] Dose required/dose in stock x volume/1 = 2000/20 000 x 100/1 = 10mls**	**1**

	[0] All other answers *(Researcher designed)*							
SECTION D: ATTITUDE REGARDING THE USE AND EFFECTS OF UNFRACTIONATED HEPARIN								
023	Patients on haemodialysis receiving unfractionated heparin may experience adverse effects. On a scale of 5 to 1 make a mark to show how would you rank your concerns about these adverse effects for patients receiving unfractionated heparin. **5** indicates great concern and **1** indicates the least concern 1 2 3 4 **5** Least Concern **Great Concern** *(Wimberley et al., 2004:46)*							**5**
024	*Choose one response for each item by placing **X** in the relevant box*							
	Item	Statement	Strongly Agree	Moderately Agree	Neutral	Moderately Disagree	Strongly Disagree	
	a	It is important to have in-service education for unfractionated heparin pharmacology before taking responsibility for administering the drug to patients *(ISMP, 2007:2)*	**5**	4	3	2	1	**5**
	b	I feel comfortable administering unfractionated heparin prepared by another staff member *(Chevalier et al., 2011:344)*	1	2	3	4	**5**	**5**

	c	I feel reporting of adverse effects from the administration of unfractionated heparin will result in punishment *(Niccolai et al., 2004:150S; Brady, Malone & Fleming, 2009:693)*	1	2	3	4	**5**	**5**
	d	Adverse effects of unfractionated heparin, are reported in my dialysis centre *(Researcher designed)*	**5**	4	3	2	1	**5**
	e	Patients are closely monitored for adverse effects of unfractionated heparin *(ISMP, 2007:26)*	**5**	4	3	2	1	**5**
	f	Seeking advice from colleagues regarding uncertainty in dose preparation is treated with ridicule *(Researcher designed)*	1	2	3	4	**5**	**5**
025	How often are patients informed of potential adverse effects of unfractionated heparin? **[3] Always**							**3**

	[2] Sometimes [1] Never *(ISMP, 2007:26*)	
026	How often are patients informed about how to manage the adverse effects of unfractionated heparin? **[3] Always** [2] Sometimes [1] Never *(ISMP, 2007:26)*	**3**
SECTION E: PRACTICE REGARDING THE USE AND EFFECTS OF UNFRACTIONATED HEPARIN *Choose one response for each item by placing **X** in the relevant box*		
027	How often is the unfractionated heparin dose administered as prescribed by the Nephrologist? **[4] Always** [3] Usually [2] Sometimes [1] Never (*Researcher designed)*	**4**
028	How often is a new dialysis patient's laboratory coagulation results checked prior to the administration of the first dose of unfractionated heparin? **[4] Always** [3] Usually [2] Sometimes [1] Never *(Pittard, 2001:75)*	**4**
029	How often is a current dialysis patients' laboratory coagulation results checked? **[3] Quarterly** [2] Monthly [1] Bi-annually	**3**

	[0] Annually [0] Never *(Reseacher designed)*	
030	When did you last refer to published literature on unfractionated heparin? State your response below in number of: **[5]** Days [4] Months [3] Weeks [2] Years [1] Never, state reason *(Researcher designed)*	**5**
031	When I am concerned about the prescribed dose of unfractionated heparin for a patient I **…** [0] Continue to administer the prescribed dose [0] Verbalise concerns to the Unit Manager **[1] Contact the prescribing Doctor** [0] Adjust the dosage…***If you gave this response go to Question 032; if not go to Question 033.*** *(ISMP, 2007:24)*	**1**
032	If I adjust the unfractionated heparin dose, I then **...** **[1] Document the adjusted dose I administered on patient's records** [0] Document only what was prescribed [0] Do not record adjusted dose on patient record [0] Other _____ *(Researcher designed)*	**0**
033	How long ago did you witness an adverse effect of unfractionated heparin? Please state answer below [5] days [4] weeks [3] months [2] years ago	**5**

	[1] Never, state reason *(Researcher designed)*	
034	In order of preference, indicate which of the following you will consult for information about unfractionated heparin or other medication used in your adult chronic haemodialysis unit. For example, **4**=most preferred; **1**=least preferred **[4] Formulary book** [3] Doctors [2] Pharmacists [1] Nurses *(Sulosaari, Suhonen & Leino-Kilpi, 2010:471)*	**4**

035	*Choose one response for each item by placing an **x** in the relevant box*						
	Item	Statement	Always	Sometimes	Usually	Never	
	a	I ask patients about bleeding tendencies prior to administering unfractionated heparin dose *(ISMP, 2007)*	**4**	3	2	1	**4**
	b	I monitor patients for anaphylactic shock. *(Schull, 2006:523)*	**4**	3	2	1	**4**
	c	I verify any allergy with patients prior to administering unfractionated heparin. *(ISMP, 2007:3)*	**4**	3	2	1	**4**
	d	I confirm the unfractionated heparin dose with another qualified renal unit practitioner before I administer it. *(ISMP, 2007:17)*	**4**	3	2	1	**4**
	e	I document adverse effects of unfractionated heparin. *(ISMP, 2007:25)*	**4**	3	2	1	**4**
	f	I inform the Unit Manager of patient's adverse effects to unfractionated heparin. *(Researcher designed)*	**4**	3	2	1	**4**

APPENDIX 11: Decoding section C knowledge questions

Decoding of Section C (Appendix 1) Knowledge open questions 016;017;018;020;021;022				
Question No.	No. Allocated	Description	No. Allocated	Further Decoding
16	1	not effective	1	effectiveness
	2	prevent circuit clotting	2	effects
	3	not absorbed orally	3	pharmacokinetics
	4	iv use only	2	effects
	5	affects internal organs	3	pharmacokinetics
	6	metabolised by liver excreted via kidney	3	pharmacokinetics
	7	GIT bleeding	2	effects
	8	take long to be dialysed by body	2	effects
	9	not absorbed by gut	4	destroyed by stomach acids
	10	cause internal bleeding	2	effects
	11	oral not available	3	pharmacokinetics
	12	prevent arterial and venous thrombosis	2	effects
	13	destroyed by stomach acids	4	destroyed by stomach acids
	14	short acting	2	effects
	15	evenly distributed between cells and plasma and is not well absorbed	3	pharmacokinetics
	16	cause local bleeding	2	effects
	17	unsure	5	unsure
17	1	bleeding	1	bleeding risk
	2	ureamic- dialyse heparin free	2	increase urea levels
	3	dosage	5	dosage
	4	check clotting profile	3	risk for complication
	5	interfere with heparin side effects	3	risk for complication
	6	heparin increases levels of urea	2	increase urea levels
	7	ensure complications	3	risk for complication
	8	good to know value	6	information
	9	unsure	4	unsure
	10	affects clotting time	3	risk for complication
	11	post dialysis bleeding	1	bleeding
18	1	intravenous		
	2	via machine dialysis lines		
	3	dosage - bolus 3		
20	1	patient temp	1	patient temp
	2	<3	2	2--8
	3	21	4	21-25
	4	23	4	21-25
	5	room temp	9	room temp

	6	<24	4	21-25
	7	<25	4	21-25
	8	<28	5	26-30
	9	<32	6	31-35
	10	<35	6	31-35
	11	36-38	7	36-40
	12	40	7	36-40
	13	2 --8	2	2--8
	14	5 --25	8	5--25
	15	20	3	18 -20
	16	22	4	21-25
	17	18 - 20	3	18 -20
21	1	hyperkalemia		
	2	nil		
	3	don't know		
	4	inhibits secretion of aldosterone		
22	1	10mls	1	10mls
	2	2000IU	2	2000IU
	3	10mls= 100	3	10mls= 100
	4	5mls	4	01--5
	5	100	5	10 --100
	6	01ml	4	01--5mls
	7	10IU	5	10 --100
	8	calculation; no answer	8	calculation; no answer
	9	1ml	4	01--5
	10	10.1ml	1	10mls
	11	10	5	10 --100
	12	1000IU	6	1000IU
	14	2mls	4	01--5
	15	10 000IU	7	10 000IU

APPENDIX 12A: SPSS example of descriptive statistics

Statistics

		age 001	gender 002 M=1 F=2	citizen 003 SA =1 OTHER =2
N	Valid	74	77	100
	Missing	26	23	0
Mean		41.054	1.753	
Median		41.500	2.000	
Std. Deviation		10.8184	.4339	
Range		41.0	1.0	
Minimum		23.0	1.0	
Maximum		64.0	2.0	

Oneway

Descriptives

age001

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
RN	48	44.92	9.562	1.380	42.14	47.69	24	64
CT	21	31.43	8.376	1.828	27.62	35.24	23	55
EN	5	44.40	5.595	2.502	37.45	51.35	35	49
Total	74	41.05	10.818	1.258	38.55	43.56	23	64

ANOVA

ANOVA

age001

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2717.774	2	1358.887	16.560	.000
Within Groups	5826.010	71	82.056		
Total	8543.784	73			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: age001
Scheffe

(I) Category	(J) Category	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
RN	CT	13.488*	2.370	.000	7.56	19.41
	EN	.517	4.257	.993	-10.13	11.16
CT	RN	-13.488*	2.370	.000	-19.41	-7.56
	EN	-12.971*	4.508	.020	-24.24	-1.70
EN	RN	-.517	4.257	.993	-11.16	10.13
	CT	12.971*	4.508	.020	1.70	24.24

*. The mean difference is significant at the 0.05 level.

APPENDIX 12B: SPSS sample of crosstabulation result

Crosstabulation result between profcate004 * poor knowledge

Crosstab

			knowledge		Total
			0 Acceptable	1 Poor	
profcate004	RN	Count	42	9	51
		% within profcate004	82.4%	17.6%	100.0%
		% within poor knowledge	72.4%	47.4%	66.2%
	CT	Count	15	6	21
		% within profcate004	71.4%	28.6%	100.0%
		% within poor knowledge	25.9%	31.6%	27.3%
	EN	Count	1	4	5
		% within profcate004	20.0%	80.0%	100.0%
		% within poor knowledge	1.7%	21.1%	6.5%
Total		Count	58	19	77
		% within profcate004	75.3%	24.7%	100.0%
		% within poor knowledge	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	9.761[a]	2	.008	.008	
Likelihood Ratio	8.383	2	.015	.013	
Fisher's Exact Test	8.291			.011	
Linear-by-Linear Association	7.510[b]	1	.006	.009	.007
N of Valid Cases	77				

Chi-Square Tests

	Point Probability
Pearson Chi-Square	
Likelihood Ratio	
Fisher's Exact Test	
Linear-by-Linear Association	.005[b]
N of Valid Cases	

a. 2 cells (33.3%) have expected count less than 5. The minimum expected count is 1.23. b. The standardized statistic is 2.740.

APPENDIX 12C: SPSS logistic regression: knowledge and professional category

Logistic Regression knowledge result

Block 1: Method = Enter

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	8.383	2	.015
	Block	8.383	2	.015
	Model	8.383	2	.015

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	77.663[a]	.103	.153

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

Classification Table[a]

Observed			Predicted		
			Poorknowledge		Percentage Correct
			0	1	
Step 1	Poorknowledge	0	57	1	98.3
		1	15	4	21.1
	Overall Percentage				79.2

a. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	95% C.I.for EXP(B)
								Lower	Upper
Step 1[a]	profcate4			6.509	2	.039			
	profcate4(1)	.624	.607	1.058	1	.304	1.867	.568	6.132
	profcate4(2)	2.927	1.177	6.185	1	.013	18.667	1.859	187.406
	Constant	-1.540	.367	17.588	1	.000	.214		

a. Variable(s) entered on step 1: profcate4.