Primary Health Care trainers' and nurses' learning experiences of using educational technology as part of an established in-service training programme in the Western Cape province, South Africa

Daniella Georgeu-Pepper GRGDAN001

A minor dissertation submitted in partial fulfilment of the requirements for the award of the degree of Master of Education (Educational Technology)

Faculty of the Humanities

University of Cape Town

2022

Supervisor: Dr Glenda Cox

Abstract

The Practical Approach to Care Kit (PACK) training programme combines an evidence-based clinical guide with an educational outreach training programme, focusing on Primary Health Care (PHC) providers in health facilities in South Africa. As the programme expands in South Africa and internationally, the health system challenges of distance, budget constraints, staff attrition, and infrastructure inadequacies require a more sustainable model which is less dependent on face-to-face facilitation. This research study focused on refining the initial design of an e-learning module and examining factors influencing its use prior to further roll out.

Department of Health stakeholders, PACK trainers and nurses from PHC clinics in the Western Cape province were interviewed. Qualitative case studies were used to generate a description of nurses' onscreen learning experiences within each specific clinic under study, and to potentially comment on any similarities or differences in these experiences across the three clinics. Initial data were coded thematically, and a list of codes was developed for application to subsequent data. The theory of situated learning in communities of practice was used as a lens to examine the PACK e-learning approach. The coding list was developed and refined as data analysis continued and was the basis for drawing out key issues and themes.

PACK stakeholders, trainers and nurses responded positively to the design of the e-learning module overall. Key findings highlighted the challenges of access to technology and internet, and digital literacy in the South African PHC context. Learning preferences, clinical content selection, time and motivation impacted learning experiences and uptake. e-Learning completion required support within a community of practice and access on smartphones was identified as a potential enabler.

e-Learning for in-service training in the PHC environment requires careful resource allocation to ensure adequate access to technology and the design of a well-supported,

blended approach to e-learning to accommodate the specific needs of this group of learners.

Key words

e-learning, primary health care, nursing, in-service, education, situated learning in Communities of practice, PACK, LMIC

Plagiarism Declaration

This work has not been previously submitted in whole, or in part, for the award of any degree. It is my own work. Each significant contribution to, and quotation in, this dissertation from the work, or works, of other people has been attributed, and has been cited and referenced. This work has been submitted to the Turnitin module and I confirm that my supervisor has seen my report and any concerns revealed by such have been resolved with my supervisor.

Signature: Date: 14 February 2022

Acknowledgements

I am deeply grateful to the stakeholders, trainers and nurses who participated in this research, and give so much of themselves to others every day, often in very challenging circumstances. Thank you to the Western Cape Department of Health for permission to conduct this study and for their support of PACK.

Thank you to the KTU leadership for the time and encouragement to pursue further studies. To my KTU team, particularly the training, design, and content teams, thank you for years of effort and dedication to this work, for your commitment to our nurses and to the soul of PACK training. Thank you to my editor, graphic designer, and transcriber for your support.

Thank you to my supervisor for the calm and constant kindness, patience, guidance, and encouragement despite many stops and starts over many years.

To my family, thank you for holding this space with me.

Contents

Table of figures

Table of tables

Abbreviations and acronyms

BANC: Basic Antenatal Care

CBS: Community Based Services

CNP: Clinical Nurse Practitioner

COP: Community of Practice

CPD: Continuing Professional Development

CPUT: Cape Peninsula University of Technology

DBR: Design-based research

DOH: Department of Health

EML: Essential Medicines List

ESS: Employee Self Service

HAST: HIV/AIDS, Sexually transmitted infections, TB

HIV: Human Immunodeficiency Virus

HR: Human Resource

ICT: Information and communication technology

KTU: Knowledge Translation Unit

LMIC: Low- and Middle-Income Country

LMS: Learner Management System

LPP: legitimate peripheral participation

M & E: Monitoring and Evaluation

MEPI: Medical Education Partnership Initiative

MO: Medical Officer

NDOH: National Department of Health

NIMART: Nurse Initiated and Managed Antiretroviral Treatment

NPO: Non-Profit Organisation

PACK: Practical Approach to Care Kit

PEPFAR: United States' President's Emergency Plan for AIDS Relief

PG Dip: Postgraduate Diploma

PHC: Primary health care

PN: Professional Nurse

SA: South Africa

SPN: Senior Professional Nurse

SURMEPI: Stellenbosch University Rural Medical Education Partnership Initiative

TAM: Technology Acceptance Model

TB: Tuberculosis

UWC: University of the Western Cape

WHO: World Health Organisation

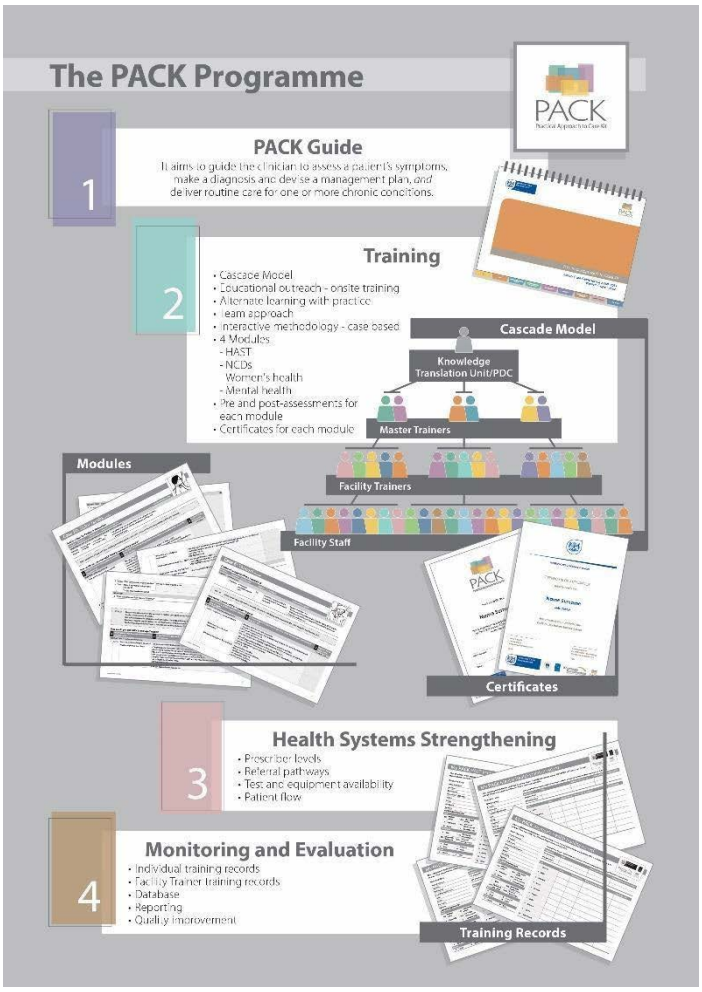
1. Introduction

This study investigates the introduction of an in-service, e-learning module in primary healthcare nurses in the Western Cape province of South Africa (SA). This thesis is most concerned with describing the experiences of teaching and learning with the Practical Approach to Care Kit (PACK) e-learning module at two Cape Town clinics in order to understand enablers and barriers to this new blended approach and suggest a way forward for these kinds of training initiatives.

1.1 Background

In-service training for South African healthcare workers is an ongoing need due to the ever-evolving nature of evidence-based practice in the health field, as well as the limitations of undergraduate training programmes. Nurses working in Primary Health Care (PHC) are required to undergo numerous in-service training programmes either during orientation to the services or whilst on the job. Developed by the Knowledge Translation Unit (KTU), the Practical Approach to Care Kit (PACK) is one of these required trainings and is a health systems strengthening initiative is designed to support PHC providers in health facilities. It combines an evidence-based clinical guide with an educational outreach training programme, health systems strengthening and monitoring and evaluation components (Figure. 1.1). PACK training aims to embed the use of the PACK guide into everyday clinical practice and improve quality of care.

Figure 1.1: PACK programme infographic



The traditional PACK training model is implemented using a training cascade: Master Trainers train Facility Trainers who in turn use educational outreach to deliver training to facility staff as teams in their health facilities. In the PACK programme this outreach strategy takes place in the form of short (1 -2 hours) training sessions in which a Facility Trainer facilitates the use of the guide by taking clinic staff through clinical cases. These sessions occur 1-2-weekly, onsite in health facilities. This allows for alternating of learning with practice and improves the likelihood of embedding use of the PACK guide in practice. A team approach targeting all cadres of staff working across programmes within a facility increases coverage and creates opportunities to discuss care coordination within a health facility (Simelane *et al.*, 2018).

Numerous challenges now face the learning design, and the comprehensive scope of the PACK guide and its training programme require four full modules (Communicable diseases, non-communicable diseases, Women's Health, Mental Health), consisting of 40 cases, that may take many months to complete at facility level, if at all. Additionally, in the health sciences, policies change regularly and so PACK is updated annually, which requires update training and an ongoing expectation of learning around PACK. Some clinics have on-site trainers (nurses or doctors) who are trained as facility trainers, others have trainers who work centrally and are allocated to train several clinics. Where there is difficulty supporting trainers, the cascade works less well.

As the programme expands even further both in South Africa and internationally, the health system challenges of distance, budget constraints, staff attrition, and infrastructure inadequacies combined with the scope of clinical content and training fidelity, require that its designers find ways to move to training models less dependent on face-to-face facilitation, and to deliver them in more flexible and sustainable ways for all those in need of PACK. Educational technology, particularly online learning, has been put forward by many as the route by which to achieve this. In the South African health context where access to some modes of educational technology may not mean internet access, it becomes important to define the layers of learning intervention functionality as it is understood locally.

For the purposes of this study the term '*e-learnin*g' is used to describe a learning intervention or tool supplied in electronic or digital format and requiring technology to access e.g. a computer, but may or may not require an internet connection. *'Online learning*' is used to describe e-learning that requires the user to be online, or connected to the internet, in order to access and engage with the tool (Moore *et al.*, 2011; Barteit *et al*., 2019). '*Blended learning'* refers to e-learning or online learning opportunities combined with face-to-face learning interactions (Barteit *et al.*, 2019).

There is a hope that e-learning may help to streamline the process towards completion of PACK training. It is, however, critical to first establish how this might work in the South

African context, by examining the possibilities around the use of educational technology for in-service PHC nursing education in South Africa, and nurses' responses to its use. The KTU developed an e-learning module to address this need. Clinical case scenarios form a large part of the training approach, and it is this component of the training package that we selected to digitise. These e-learning cases underwent extensive development between 2016 and 2018, with the design process informed by context and educational technology literature and theory. This study examines the use of the PACK e-learning cases at PHC level, with the aim of informing both the design and implementation strategy in the Western Cape, elsewhere in South Africa, and globally.

1.2 Key debates

It is widely acknowledged that we face a serious shortage of skilled health professionals, and that efforts to "increase the quantity, quality and relevance" of health professionals' education are essential to meeting global population health needs (Karaman, 2011; Bluestone *et al.*, 2013; WHO, 2013). An improvement in the quality of education will require better linkage between the curriculum and population health needs as well as changes in teaching strategies. The World Health Organisation (WHO) and others are working towards "addressing the technical dimensions that can bring about a new era for health professional education" and call for innovative educational strategies and taking an in-depth look at how education is delivered (Bluestone *et al.*, 2013; WHO, 2013). The message is to focus on:

1. Producing more health professionals,
2. With better, more relevant skills,
3. And improving/maintaining the skills of those already providing the service.

In-service training or continuing professional development (CPD) is responsible for the ongoing education and training of healthcare professionals in health policy changes (Feldacker *et al.*, 2017). PACK has, over 20 years, been refined and scaled up both nationally and in other countries, producing encouraging results: Quantitative data shows consistent improvement across a range of indicators like appropriate referral of severely ill clients, TB case detection, prescribing changes, and others (Fairall *et al.*, 2015).

Qualitative work shows that the intervention was highly valued by healthcare providers who recognise the benefits of the onsite training, proximity to clinical practice, advantages of alternating short bursts of training with practice, and role of an onsite trainer in supporting uptake of the guideline recommendations over time (Stein *et al.*, 2008; Fairall *et al.*, 2015). It has been widely scaled in South Africa, where more than 300 000 copies of the PACK guide, including annual revisions, have been distributed alongside the training programme which has reached more than 25 000 nurses in 3000 clinics (Image 1). Over 800 nursing, medical, and clinical officer students have also been trained as part of partnerships with University of Cape Town, Stellenbosch University, Walter Sisulu University, and nursing colleges. University of Cape Town began routine integration of PACK in medical student undergraduate training in 2016.

Image 1: A clinic nurse using PACK during a consultation with a patient

The South African Primary Health Care (PHC) service is nurse-led (Mash *et al.*, 2012). This role has become an increasingly strenuous burden as the nursing scope of practice and the population they serve grow exponentially. Nurses delivering care in PHC facilities for tuberculosis (TB), family planning, childhood illness, or HIV care for example, are

expected to attend in-service courses for each condition to be authorised to manage it. These are generally off-site, for 1 to 2 weeks or longer, sometimes supplemented by varying quality of workplace supervision and clinical mentorship, often with submission of a portfolio of evidence. Off-site training may negatively impact facility staffing and patient care (Feldacker *et al.*, 2017) and can result in large volumes of content knowledge being delivered with little opportunity for its practical application. The PACK training model aims to reduce staff being off-site for training and to improve the alternation of learning with practice.

In South Africa, completing this training is a key clinic indicator for the Ideal Clinic initiative, a National Department of Health (NDOH) programme designed to improve PHC clinic performance over a range of indicators, including staff training (National Department of Health, 2018).

1.3 Research questions

The proposed research aims to explore Primary Health Care trainers' and nurses' learning experiences of using educational technology as part of the established in-service PACK training programme in the Western Cape Province of South Africa. The overarching question that guides this study is:

What are Primary Health Care clinic trainers' and nurses' learning experiences of using educational technology as part of an established in-service training programme?

Sub-questions:

- What are the perceptions of government stakeholders of the use of educational technology in in-service training?
- What access do nurses have to technology in clinics?
- Does the digital literacy and past online learning experiences of trainees and nurses influence learning?

- How did trainers and nurses respond to the PACK e-learning design?
- What teaching strategies do trainers use?
- What are the barriers and enablers to learning for nurses in clinics?
- How has the situated learning in a community of practice approach been appropriated in PACK e-learning training?

With a deeper understanding of the above research questions, the study objectives are to:

1. Evaluate the strengths and weaknesses of the PACK e-learning design.
2. Describe challenges and recommendations in the areas of e-learning implementation: technology, systems and infrastructure, content, and approaches to learning to inform health system decision-making for the future.

1.4 Conceptual and Theoretical approach

In order to understand the complexities of introducing PACK e-learning into clinics this research will interrogate a number of aspects including the basic infrastructure in terms of access to technology, the teaching strategies of the trainers and their competencies, and the students' digital literacy and how they learnt and responded to the training.

Access to technology refers to the participants ability to access the resources required to engage with the e-learning module in this case either a desktop computer, laptop or tablet. Digital literacy refers to participants' abilities and comfort in engaging with various forms of technology, including computers and laptops, the internet and smartphones and various applications like Facebook and WhatsApp. How trainers approached the introduction and ongoing support of the PACK e-learning module is explored by examining teaching and learning strategies, particularly the combination of e-learning and face-to-face training (blended learning).

1.4.1 Theoretical approach

In this study the aim was to examine how learning took place and the factors influencing course completion in detail. The purpose here is to clarify the relationship between the materials, the trainers, and the learners. A theoretical approach was needed to explain this relationship. Learning theories explain the approach of the trainer and the response (or lack of response) of the learner.

Situated learning and learning in a community of practice (COP) are the lenses chosen to understand the implementation and uptake of the PACK e-learning module. Situated learning happens in a social context amongst people who are involved in an activity together (Lave, 1991). In order to claim to be a community of practice all three of the following characteristics must be present: (1)*The Domain*: is a specific area of interest, which requires commitment and competence; (2)*The Community:* must actively guide, discuss, assist one another, take part in activities, share knowledge and (3) *The Practice:* is a long term undertaking, develops skills and tools over time (Wenger and Trayner-Wenger, 2015). As COP was one of the underpinnings of the face-to-face approach it became important to understand if the Domain, Community and Practice could be achieved in the e-learning module, and if so, how.

1.5 Research design

The use of a qualitative case study approach was used to generate a rich understanding and description of the experiences of trainers' and nurses' use of an e-learning module in two Primary Health Care (PHC) clinics in the Western Cape province of South Africa.

The population under study at the two clinics included trainers and nurses who were involved in PACK training. Two Department of Health stakeholders were also interviewed in order to provide a government/management perspective of the introduction to PACK. Purposive sampling ensured that participants were representative of settings with varying degrees of management and doctor support, facility size, human and financial resources. This aimed to highlight possible health systems issues that could impact implementation

of e-learning modules (Green and Thorogood, 2009). The defining inclusion criteria was that participants should be either a Professional Nurse (PN), Clinical Nurse Practitioner (CNP) or medical officer (MO) using the PACK training package, as they are the target of PACK training and included facility trainers. Exclusions from the study were other cadres of health workers (like lay health workers) whose scope of practice restricted their use of the PACK guide.

Qualitative interviews in each clinic were conducted to establish baseline information on computer literacy and access to technology. Interview questions revealed user learner experience and engagement. Responses included descriptions of challenges in terms of being content-related, technology-related, and infrastructure-related or other reasons. All qualitative interviews were audio-recorded and transcribed verbatim. Initial data was coded thematically, and a list of codes was developed for application to subsequent data. The reliability and validity of the data by the exploration of similarities and differences within and between the cases, and the ongoing discussion of emerging findings with supervisors and colleagues (Maxwell, 2009) and key themes are illustrated with extracts from the data as appropriate. Data extracts were not edited for grammatical correctness, and it is important for the reader to note that many participants are not first language English speakers. Data was coded and analysed thematically, and Microsoft Excel was used to store, code, and organise the findings.

1.6 Significance of the study

This study aims to provide data on an e-learning approach for in-service training in health sciences in South Africa. As the National and Provincial Departments of Health, nursing and medical departments of higher education institutions and multiple support partners embark on significant investments in e-learning for in-service health science professionals in PHC, and in the absence of substantial data on the topic, this study hopes to deepen the understanding of this process from both a technical and pedagogical perspective. Beyond South Africa, PACK is in various stages of roll-out in Botswana, Brazil, Ethiopia, and Nigeria. There is demand for PACK from other countries. The learnings from our

PACK experience in South Africa feed into refining the programme for use in other low- and middle-income countries (LMICs), and this iterative approach to the development and refinement of PACK could well apply to the learnings from this study, informing the implementation of the PACK Global package.

1.7 Organisation of this thesis

This thesis is organised according to the University of Cape Town School of Education regulations for thesis chapters. The following chapters include a review of theoretical concepts and literature in the field of study highlighting concepts of access, digital literacy, teaching and learning approaches. The methodology chapter focuses on the type of research as well as more detailed information on the study population and procedures. The findings chapter explores the experiences of trainers and nurses in relation to their experience of the PACK e-learning cases, linking and the overarching Department of Health perspectives. The discussion links these findings with the literature and theoretical framework. Lastly the summary and recommendations chapter identify key learnings to take forward into future iterations of PACK e-learning design as well as potential learnings for the broader audience in in-service primary health care education.

2. Literature Review & Conceptual and Theoretical Framework

2.1 Literature review strategy

To better understand the work already achieved on the topic of e-learning for PHC nurses and to inform the research questions, a literature review was conducted with search terms including the following:

“technology, online, e-learning, in-service nursing education, south africa” and "Search (primary Health care or primary care) AND (eLearning or educational technology) AND (nurses or nurse) AND (post graduate training or in-service training) Sort by: [pubsolr12]"

This search was initially conducted for the period 2011 - 2018 and then again for the period 2015 - 2021. These searches were conducted on both Google Scholar and the PubMed database. Specific journals were searched e.g. Biomed Central Medical Education, and hand searches of specific references in selected articles was also done. A revised search for the time period 2015 - 2022 was conducted in January 2022 on Google Scholar included the following terms:

“technology, online learning, e-learning, in-service nursing education, primary health care, south africa”.

With over 20 000 results on Google scholar, in each search the first 10-20 pages of results for each search were evaluated and approximately 70 articles were selected over time to be screened for in-depth review based on relevance of concepts, theories, context, methods, key learnings and accessibility. Due to the paucity of articles available speaking directly to the specific context of this study (South African Primary Health Care nurses), a nuanced approach to selection was required to account for the distinct contextual differences between undergraduate, university-supported education vs. in-service

government-supported environments, particularly the difference between in-service learning in well-resourced tertiary hospitals and often poorly resourced PHC environments. The following inclusion and exclusion criteria were followed:

Inclusion criteria: LMCI contexts, in-service learning, descriptions of learning interventions, pre-service examples in LMCI or South African context that could be generalisable to the in-service context, examples of health care provider cadres such as doctors, pharmacists in appropriate settings or similarly resourced settings.

Exclusion criteria: first world contexts particularly reporting pre-service university experiences, technology use in diagnosis and treatment as opposed to learning, absence of e-learning, focus on doctors or cadres in non-generalisable settings.

A total of 28 articles were ultimately considered for inclusion in the review for this section (noting the University of Cape Town total limit of 50 references allowed for the minor dissertation), and the following sections describe the key findings of the review and how they articulate with the research questions.

2.2 Introduction

In 2011 the World Health Organisation articulated the need to transform health professional education in the same way the healthcare environment is being transformed by science and socio-economic shifts. While highlighting the content required to produce 'relevant' health professionals, it did not speak to how to deliver that content (WHO, 2011). The message from Palen *et al.* (2012) in their article on health system strengthening is similar and advises that countries need to work on competencies and professional advancement of health professionals but does not address the 'how to' aspect. One of the four major health system strengthening issues they raise is human resources for health. According to the authors it is well known that the biggest challenge in delivering quality healthcare is the lack of skilled healthcare workers (HCWs). The authors say a move to "invest in human capital" should be guided by national health authorities/structures and highlight the need for retaining "skilled, qualified and relevant health care providers"

(Palen *et al.*, 2012: S113). Their advice remains relevant today, as the methods to achieve these aims, including educational technology, continue to be explored.

The following is a summary of various examples of global and African research and large-scale reviews of in-service health services education as they emerged from the literature search and then linked to the research questions and objectives in Chapter 1. The following themes will be addressed: access to technology and digital literacy, infrastructure, teaching and learning approaches, mobile technology and time and motivation. Of note is the lack of clearly articulated examples of interventions and learning theory used to plan and implement in-service nursing teaching in the specific PHC context under study.

2.3 Global perspectives

2.3.1 Access to technology and digital literacy

The challenges of access to technology and digital literacy in rural and/or poorly resourced settings was a concern raised by authors in this field. A systematic review of CPD for rural allied health workers, including mostly Australian, USA and Canadian studies found that access to equipment, internet, and support during e-learning as areas of concern (Berndt et al. 2017). Three of 22 systematic reviews in Rouleau *et al.* (2017) raised technical issues, digital literacy, access and time as concerns for nurses. The difficulties of infrastructure and adoption of e-learning for medical education was described in low-and-middle income countries (Barteit et al 2019). Additionally, there was a paucity of evidence around understanding educational approach, technology and context (including electricity and internet connectivity) reported (Barteit et al. 2019). A study on in-service learning for public health system pharmacists in Brazil also noted that infrastructure and internet access influenced learning outcomes, with limited experience in ICT and poor internet being a threat to course completions and support from tutors being critical to success (Manzini *et al.* 2020). Similarly, internet connectivity and digital literacy are listed as areas for consideration in Bashingwa *et al's* (2021) report on Indian health care workers use of a mobile phone training intervention - specifically noting these may impact uptake, knowledge gains and service delivery.

2.3.2 Work setting

The work setting and environment may be a consideration for e-learning success. Work setting significantly influences perceptions of online learning, while age, length of work experience, urban vs rural, were not statistically significant influences (Karaman 2011). Karaman's study (2011) explored Turkish nurses' perceptions of online learning using a quantitative survey method, it included 1041 registered nurses looking at perceptions in terms of work geographical area, work setting, frequency of computer use and age. Significant differences were recorded according to work settings, with nurses from non-hospital clinics having fewer positive perceptions of online learning. Nurses most likely to use online learning are those working in small scale health centres, and the more

computers are used daily the better the experience with online learning (Karaman, 2011). For pharmacists in-service e-learning in Brazil, it is not only the content of the course that is important to consider but also the work environment, characteristics of the health professional as well as infrastructure available (Manzini *et al* .2020).

2.3.3 Teaching and learning approaches

As one of the aims of this study was to refine the development of the PACK e-learning module, it was important to understand the teaching and learning approaches recommended by colleagues in the field.

Teaching and learning approaches that appear to have some success include case-based, interactive and facilitator-supported (blended), learning interventions that are situated in practice. Case-based learning was hailed as a positive, interactive technique with similar learning outcomes to live patient interactions. The learning outcomes of problem-based learning studies were inconclusive, but they reported higher levels of critical thinking and decision making (Bluestone *et al.*, 2013). Bluestone et al. conducted a large, systematic, integrative review on "*Effective in-service training design and delivery*", with the aim of reviewing education and training articles to identify effective strategies for health worker in-service training (2013). Nurses valued the "social interaction", and "authentic scenarios and practicing skills in the workplace", noting that convenience and timesaving were attributes of e-learning (Rouleau *et al.*, 2019:11). In their postgraduate medical e-learning model, De Leeuw *et al.* (2016) recommend problem-based learning to enhance motivation and understanding, as well as interactivity to improve higher order thinking should be important design considerations. Nurses increased their knowledge and skill with e-learning, but the educational approach and theoretical underpinning in many of the studies under review, as well as information on contextual factors influencing learning, was not specified (Rouleau *et al.*, 2019).

Didactic lectures were found to be less effective than other methods in a variety of studies. Simulation was widely reported as being key to the development of psychomotor and clinical decision-making skills, as well as identifying knowledge deficits (Bluestone *et al.*,

2013). Practice, ongoing mentorship and instructor interaction were identified as critical components of bettering learning outcomes (Bluestone *et al.*, 2013; Manzini *et al.* 2020'; Anand *et al.* 2021). Interactivity is superior to didactic methods and key to positive learning outcomes (Bluestone *et al.*, 2013). The detail of *how* this should be delivered must be explored further but it is noted that interactivity was a feature of all the successful computer-based programmes and psychomotor skill development may need onsite support and feedback. In their study, computer-based training produced knowledge and attitude results that are the same or marginally better than face-to-face sessions, but a lack of evidence exists on changing practice behaviour (Bluestone *et al.*, 2013). In a large-scale, mobile-phone based learning application for a neonatal course in India, facilitators were specifically assigned to enrol, monitor and motivate group members during their learning - noting contextual support as critical to both acceptance and completion of the course (Anand et al. 2021).

Repetition of learning opportunities or interventions is widely supported by evidence: face-to-face, once-off instruction is less effective than (internet or mobile technology-based) "repetitive, time-spaced education exposure" (Bluestone *et al.*, 2013) .While method of delivery does not (always) influence outcomes, and comparison of face-to-face training versus video-conference both result in improved knowledge, four of the studies reviewed noted a preference for interaction and contact with both facilitators and other learners was noted (Berndt *et al.*, 2017). Blended learning is described as e-learning, technology-supported or online learning opportunities, combined with face-to-face learning interactions (Moore *et al.*, 2011; Barteit *et al.,* 2019) and although few reviews explicitly state the use of blended options in their studies, the combination of learning methods appears to be a recommendation (Berndt *et al.*, 2017; Rouleau *et al.*, 2019). In Brazil, pharmacists responded positively to mixed methods (face-to-face and online) and materials (printed and electronic/online) as well as course content directly associated with their work roles (Manzini *et al.* 2020).

While the above provides broad guidance on possible approaches, detailed descriptions of learning interventions as well as evidence of changed clinical practice as a result of e-learning does not appear well reported on and remains a gap in the literature.

2.3.4 Mobile technology

How e-learning is delivered is an important consideration and the use of mobile technology emerged as a theme in the literature. Mobile phones may provide valuable and flexible options for providing e-learning via web- or application-based platforms (Masters et. al 2016; Anand *et al.* 2021; Bashingwa *et al.* 2021). Reminders (via mobile technology) reportedly improved correct management of patients in a Kenyan study and two other reviews. Using point of care (handheld devices) is more effective than printed material, and games have potential but there was no conclusive evidence for its teaching and learning value (Bluestone *et al.*, 2013). Animation (delivered on a mobile device) was well received and improved clinical skills but not by much. Print media is advised against in changing practice behaviours (Bluestone *et al.*, 2013). More recently Bashingwa *et al.* (2021) reported on a large-scale implementation of a mobile phone refresher training course for frontline health care workers in India, noting this as a potentially affordable and scalable option in other contexts.

2.3.5 Summary

Access to technology is assumed to be more ubiquitous in the generally better-resourced Global North than it is in the context of this study, and there was a mix of LMIC, and better-resourced settings included in the reviews selected for this literature review. It appears that the more computers are used on a regular basis, the better the experience with online learning (Karaman, 2011). Thus, digital literacy will be different in South Africa as it relates to access. However, despite the economic disparity in some cases, there are some useful examples and valuable lessons to be derived from the global experience.

With regard to the work setting, nurses from non-hospital clinics had less positive perceptions of online learning than those in hospitals. Health workers most likely to use

online learning are those working in small health centres. This is an important consideration in the PACK e-learning study and needs to be better understood or defined for the SA context, particularly as in SA hospital settings are often considered to have better technology infrastructure than PHC clinics. Multiple studies which used computers as the mode of delivery found self-directed learning adequate and possibly more useful, but that it should be engaging and interactive. Clinically integrated teaching impacts learning (via onsite or simulation training) and there is value in creating learning opportunities that are similar to the work environment (Bluestone *et al.*, 2013), which speaks to the theory of situated learning, further explained later in this chapter.

There is a lack of evidence for changing practice behaviour, which is critical in health care settings and a key aim of the PACK programme. Print media is advised against in changing practice behaviours (Bluestone *et al.*, 2013), and supports the fact that passive dissemination of the PACK Guide is strongly discouraged and is partnered with a training programme. Government investment in infrastructure and support of in-service learning is noted in Brazil (Manzini *et al.* 2020), with ongoing mentorship identified as a key to success (Manzini *et al.* 2020 and Anand *et al.* 2021).

2.4 The African perspective

2.4.1 Access and digital literacy

In sub-Saharan Africa's rural areas, access to electricity, technology, smartphones, and reliable mobile service (phone reception), and the internet is limited, excluding many from opportunities to explore e-learning (Feldacker *et al.* 2017). In a scoping review of reviews to inform development of continuing professional development for health care workers in Rwanda, authors Ngenzi, Scott and Mars (2021) noted that only six articles were ultimately chosen for inclusion, highlighting the limited data available in the sub-Saharan/LMIC context to this day. The review notes the barriers to e-learning remain challenges with internet connection, equipment availability, readiness to use technology and digital literacy.

Feldacker et al (2017) conducted a large qualitative study on continuing professional development (CPD) for medical and nursing staff in Malawi, Tanzania, and South Africa and noted that this is exacerbated in primary healthcare facilities as often district-level hospitals have better infrastructure. Large scale, systematic planning and funding mechanisms are required to improve access and must include efforts to provide for the digital literacy of these cadres (Feldacker *et al.*, 2017). The Medical Education Partnership Initiative (MEPI) supported development and retention of medical graduates in 12 sub-Saharan countries, with a large focus on scaling up technology infrastructure and assisting with the creation of rural hubs and distance education interventions, amongst others (Omaswa *et al.*, 2018). A linked project, Stellenbosch University Rural Medical Education Partnership Initiative (SURMEPI), ran for 5 years and saw the PACK guide and training implemented in years 2 – 6 of the undergraduate medical curriculum. It is here that the KTU piloted early attempts at e-learning using the Moodle Learner Management System (LMS). The MEPI project report (Omaswa *et al.*, 2018) highlights that despite great investment, innovation and advancements, lack of infrastructure and ICT training can halt sustainability of donor interventions. A rural South African study on the use of mobile phones in healthcare echoed these concerns about infrastructure and digital literacy (Watkins *et al.*, 2018).

A recent nursing campus study, conducted in KwaZulu-Natal in South Africa, examined ten colleges' preparedness to use a computerised training programme for in-service or pre-service training (Naidoo, Sandy and Roos, 2020). They found that computer literacy was an issue for both educators and students. Nurse educators with exposure to post-graduate studies and who were ‘young’ were more comfortable with computers. An earlier study in Gauteng, South Africa, found nursing diploma students struggled with computer literacy (Maboe & de Villiers, 2011). Similarly, Mars (2012) highlighted that many nurses do not have access to computers at home, and at work computers are generally locked away in managers’ offices and not easily accessible.

If these access and digital literacy issues continue in the forefront of the nurse experience of e-learning in PHC, then this remains a major consideration in multiple aspects of the PACK e-learning design.

2.4.2 Infrastructure support

Even in those areas with some access to educational technology, the challenge of making sure the technology works well, and is appropriately supported, when using it for instruction cannot be underestimated. Maboe & de Villiers (2011) reported that students who struggled with technology did not have support to learn more about how to use software packages, and there was not a sufficiently skilled tutor available to support the learning activities. Mars (2012) reported similar issues - due to power outages, broken equipment at sites receiving video feeds, dropped calls due to bandwidth deficiencies and the blurred way in which PowerPoint slides rendered onto video. One could expect similar issues to occur for PHC nurses attempting to complete e-learning.

Since the Mars article was published in 2012, one would think bandwidth issues had improved. However, it is widely acknowledged, particularly in rural SA, that having coherent, uninterrupted calls or even meetings on Zoom, MS Teams or Skype is still often extremely challenging due to frequent power cuts and unreliable internet connections. In Zimbabwe where their nurses experienced regular power cuts and phone reception issues impacting ability to complete a blended learning course, Bertman *et al*. (2019) note similar challenges. In their recommendations for future development Ngenzi *et al.* (2021) include the fact that infrastructure must provide ongoing and cost-effective support for selected e-learning interventions and those prospective participants have *'affordable access to programmes, required equipment and required connectivity"*. These are important learnings with which to view and analyse the PACK e-learning experience.

2.4.3 Teaching and learning approaches

There is some helpful data emerging on the learning approaches used for e-learning in this context. In their systematic review of strategies to improve HCW practices in LMICs,

Rowe *et al.* (2018) highlight the efficacy of training strategies combined with group problem solving and supervision and suggest that this is included as a component of interventions. They note that ICT has potential, but it has only resulted in small-to-modest effects on training and skills provision. The Rwanda scoping review (Ngenzi *et al.* 2021) notes that e-learning of various descriptions is comparable to face-to-face learning in enhancing both knowledge and skills, but blended learning outcomes are less conclusive. In Zimbabwe 293 healthcare workers across over 200 facilities participated in a blended learning course which consisted of face-to-face classroom time at the beginning and end of the course, and tablet-based learning with WhatsApp communication in groups and partners. While the tablet-based learning intervention is not described, the article highlights the value of the interactive WhatsApp group, partner, and facilitator interactions for review of content, real-time experiences and access to those with more advanced clinical experience (Bertman *et al.* 2019).

In Maboe & de Villiers (2011), preferences around computer-based learning were surprising in that, even though so many of the students appeared to have limited exposure and proficiency, study participants preferred computer-assisted instruction.

A KwaZulu-Natal based e-health article Mars (2012) speaks specifically to the context of medical education in sub-Saharan Africa, although there is some mention of nursing education and the two are linked in clinical practice to some extent. They used video conferencing with some success, and in areas where direct feeds of video could not be broadcast due to infrastructure and bandwidth challenges, material was sent via post on DVD. While this was unfortunately not interactive or synchronous, the quality of the sessions was still considered good and there was a positive response to video conference teaching over time. In terms of outcomes, there was no difference in examination and assessment results between those attending classes and those watching videos of classes.

In the higher education context, the issue of educator skill or interest in creating positive learning opportunities for students in their use of educational technology has been raised:

Mars (2012) relays that the only real complaints about video conferencing were related to the quality of the PowerPoint slides (too much text, text too small, odd colours), although teachers themselves rated the video delivery of sessions highly. Similarly, Maboe & de Villiers (2011) assert that nurse educators today will be required to think differently about their approach and methods of instruction and will need to consider a shift from the conventional to more computer-assisted or computer-based learning. Most interesting here is the statement *"The use of educational software did not produce an adequate level of achievement of learning objectives. Many students found it difficult to achieve their learning objectives when utilising these learning resources"* (Maboe & de Villiers, 2011: 101). The authors continue to say that sound educational principles in the design of the resources were not used, and the creation of a conducive learning environment in which students could determine their own pace and share with each other was not achieved. But, they maintain, students had more satisfaction and excitement and developed both technical and thinking skills, including learning from their mistakes. In their recommendations, the authors point to courses which might be valuable for nurse educators – these include facilitation skills, constructivism, and computer-assisted instruction. Similarly, Ngenzi *et al.* (2021) call for e-learning approaches that incorporate "*educational theory, conceptual frameworks and appropriate andragogy.",* including adult education principles.

These readings indicate that e-learning has the potential to be successful in terms of learning outcomes, but that interventions require a considered approach to learning methodology and may require ongoing support in various forms.

2.4.4 Mobile technology

As in the global literature, there is potential for the use of mobile technology for e-learning shown in African studies. A nine-province study in South Africa showed that smartphone access is high amongst nurses, but that the cost of data is prohibitive (Fischer et al., 2019). Another rural South African study found that nurses who use their phones (and use the

internet on their phones) are more open to using computers. These nurses required initial support to access applications on their phones, for example, the Essential Medicines List (Watkins et al., 2018), and one can argue the same would apply for e-learning. In Rwanda the use of mobile phones for a health training programme (mHealth/mLearning) was evaluated: Mobile devices were valuable for creating learning opportunities for CPD in under-resourced areas, highlighting that they considerably improved knowledge and practice in midwives (Nishimwe et al., 2021). Health Care workers in Zimbabwe were also able to use their mobile phones as a group interaction component of a blended learning course, but noteworthy is limited capabilities of individual phones in terms of storage space and limited connectivity due to contextual factors in such settings (Bertman *et al*. 2019).

2.4.5 Time and motivation

Human resource shortages result in difficulties in healthcare workers finding time to attend CPD (Feldacker et al. 2017), as learning requires them to leave their patients. Additionally, this study notes that nurses do not yet regard CPD as something that should be self-motivated or an opportunity for personal advancement. In the Watkins et al. (2018) study, nurses were interested in phones and computers for learning but were concerned about time constraints at work. Highlighting barriers to e-learning found in their scoping review of reviews Ngenzi *et al*. (2021) included *"time constraints and the issue of working from home"* particularly for those HCWs in working in areas where time is not available at work, and it is challenging to negotiate time available outside of working hours. This indicates a possible link between having enough time to engage in learning and how motivated one is to pursue that learning. Although no other references for the link between time and motivation were found for this context, it remains worth noting for the topic of this study.

2.5 Conclusions

Access to infrastructure, equipment, internet connectivity and digital literacy are common themes influencing e-learning in HCWs across the globe. Various options exist for delivery of e-learning, with mobile technology interventions (e.g. smartphones) increasingly being reported on. There is little doubt that e-learning interventions have great potential to enhance learning in the health sciences, the question that remains is more detail on "how?" (Barteit *et al*., 2019; Rouleau *et al.*, 2019; Ngenzi *et al.* 2021), particularly for in-service nursing education in LMICs. It was noted that there was little quality data on the topic in LMICs and Bluestone *et al.* (2013:1) concluded that ***"****The research agenda calls for well-constructed evaluations of culturally appropriate combinations of technique, setting, frequency and media, developed for and tested among all levels of health workers in low- and middle-income countries".* This remains true and is a gap in the literature that the PACK e-learning experience may contribute to. Similarly, Barteit *et al*. (2019) call for rigour in evaluations of e-learning in LMIC medical education to enhance these interventions.

Educational design of e-learning should be a critical consideration for educators/developers and outcomes should be rigorously evaluated. In South Africa, the instructional designers of in-service nursing education resources are often from a higher education context, and so the skills required to design and deliver e-learning interventions should be thoughtfully interrogated by those involved (Maboe & de Villiers, 2011; Mars, 2012; Ngenzi *et al.,* 2021). Modest effects in most studies make understanding how best to design PACK e-learning learning for this context even more critical.

A combination of educational strategies was required to begin the move to digitise the PACK training package, and the aim was that the approach was well grounded theoretically, evaluated and reported on. While the focus of this work initially was on refining the development of the e-learning cases themselves, the contextual implementation factors could not be ignored and strongly influenced design choices. Careful consideration and strategic planning for the future of e-learning in the LMIC context are important, particularly the issues of financing in-service nursing educational

infrastructure, ongoing maintenance and ICT support, situational assessment of technology access by nurses in PHC facilities in SA (Masters *et al.*, 2016; Feldacker *et al.*, 2017; Naidoo, Sandy and Roos, 2020; Ngenzi *et al.,* 2021) and evaluation of outcomes on clinical practice (Berndt *et al.*, 2017; Rouleau *et al.*, 2019).

2.6 The theoretical lens: Situated learning in Communities of Practice

"Instead of making e-learning technology-centred, developers should subscribe to a learning theory to ensure the design is guided by pedagogical principles."
(De Leeuw et al., 2016)

Situated learning theory asserts that learning happens inadvertently, embedded as part of an activity within a specific culture and context and not deliberately or abstractly, as in a classroom, for example. Often this learning takes place within the context of working together socially, or in "*communities of practice"* (COP) (Lave, 1991). People are surrounded by communities of practice and form part of many of them, in different capacities and with various levels of involvement. Situated learning theorists argue that in this context as people interact, over time, they learn. People develop practices that are the property of the social context in which they are learnt and in the case of PACK training, the health system and clinic setting. The community has certain beliefs and behaviours which learners must acquire as they transition from outsider to become a central member of the community. This is referred to as *"legitimate peripheral participation"* (LPP) As they become more adept and involved in the key activities and processes of the socio-cultural community, they move from LPP to full participation (Lave, 1991).

There are similarities between the way this learning occurs and the way the PACK training programme is designed to work. e-Learning is often perceived as an individual task completed alone, but in the case of PACK training is it possible to establish if e-learning

can still occur within a COP and has space to accommodate an e-learning approach? In this case, it becomes important to better understand this theory.

Li *et al.* (2009) and Smith, Hayes and Shea (2017) note that the theoretical constructs defining and informing COP continue to change and expand over time. For the purposes of this study, to be a COP all three of the following characteristics must be present (Wenger and Trayner-Wenger, 2015; Smith, Hayes and Shea, 2017):

- The Domain is a specific area of interest which requires commitment and competence i.e. knowledge and use of the PACK guide;
- The Community must actively guide, discuss, assist one another, take part in activities and share knowledge i.e. participation in PACK training;
- The Practice is a long-term undertaking, develops skills and tools over time i.e. application of PACK guidance, health systems strengthening at individual and clinic level.

Within a COP, there is interaction around joint enterprise, mutuality, and shared repertoire. In *joint enterprise*, the community must develop together their viewpoint of what they stand for. A good understanding of this results in competence. Then, through the process of interaction within the community, relationships of *mutuality* or trusted engagement are created, with learning forming part of an identity, and the value of pursuing that identity finding its place within the COP. By using the communal resources or *shared repertoire* in an accepted way, a community member is considered competent. Additionally, momentum is required to keep learning, with internal *leadership* (at various levels within the COP) and *connectivity* (access to help or discussion in various forms) of and between COP members is needed to provide support to the process (Wenger, 2000a; Smith, Hayes and Shea, 2017).

The PACK face-to-face model of training uses situated learning theory at various levels in a successful way and so the educational technology challenge was how to replicate and potentially improve that approach using COP as part of the e-learning strategy. One of the key elements applicable here is that the clinical content is embedded within

activities, and generated via these activities, emerging as part of the group discussion. The core focus of the cases is not to teach clinical content as that is (mostly) part of basic training and other in-service training provision. The core focus is to teach an approach to using the PACK guide, accessing its content safely and methodically, and to embed its use in everyday practice (competence) but key clinical content is generated by what is important within that group at that time, and is created within the discussion of the case.

"The class is not the primary learning event; It is life itself that is the main learning event" (Wenger, 2006:4). Similarly, it is the real-life case reflections and discussions in the training approach which PACK developers emphasise strongly is important to preserve, and this was held as a guiding principle in the design of the e-learning module. Applying these concepts to the e-learning training development and attempting to encourage the creation of spaces in which this competence can develop within the clinic by using the e-learning cases as a template or platform for interaction, completion of PACK training and the practical application of using PACK on a day-to-day basis may (continue to) become embedded as part of the culture and required competence of being a full member of the clinic community.

2.6.1 How has situated learning theory been applied by others in Nursing Education?

Situated learning theory in nursing education literature focuses largely on simulation, and often for undergraduate nursing students (unlike qualified professional in-service education), has little reference to communities of practice. Options for situated e-learning in this field could include e-learning tutorials, simulations and the use of cases and games (Feng *et al.*, 2013).

In exploring simulation and situated learning in nursing education, Onda (2012:e276) looks at applying the Herrington and Oliver (1991) design elements that "best contribute to gaining usable knowledge". Of note in their example is that they apply it using a case scenario of a patient presenting with a heart attack (as done in PACK training). Although a more practical learning session (simulation), some of the principles remain the same.

Onda (2012) concludes that the approach of applying situated cognition does indeed help to build competent nurses as long as there is a strong combination of solid content knowledge and real-life learning opportunities.

In their systematic review of the effectiveness of situated e-learning on medical and nursing education, Feng *et al.* (2013) reported that compared to the absence of any training, situated e-learning had a positive effect on learning. They argued that situated learning was not as good as traditional teaching, and yet it still had a positive effect on students' practical clinical performance but not on their knowledge. In this case it had no significant effect on clinical performance of clinicians. This statement is particularly concerning as the primary audience or end-user of the PACK programme currently is the practising clinician, and the main outcome we need to see in PHC is changed practice. The authors do, however, indicate that a reason to consider is computer-literacy of clinicians versus students and this may be worth exploring more in the SA context (Feng *et al.*, 2013).

Li *et al.* (2009) article on the application of COP in health made some important observations, particularly around the shifting definition of COP, sharing others' concerns about how it is applied in research (Smith, Hayes and Shea, 2017). Li *et al.* (2009:11) suggest that organisations target select elements of the concept, like providing "support for members interacting with each other, sharing knowledge, and building a sense of belonging within networks/teams/groups". They note that providing facilitators in order to improve group cooperation and engagement, and the use of technology-supported communications have potential to enhance COPs in this setting.

2.7 The PACK face-to-face training design

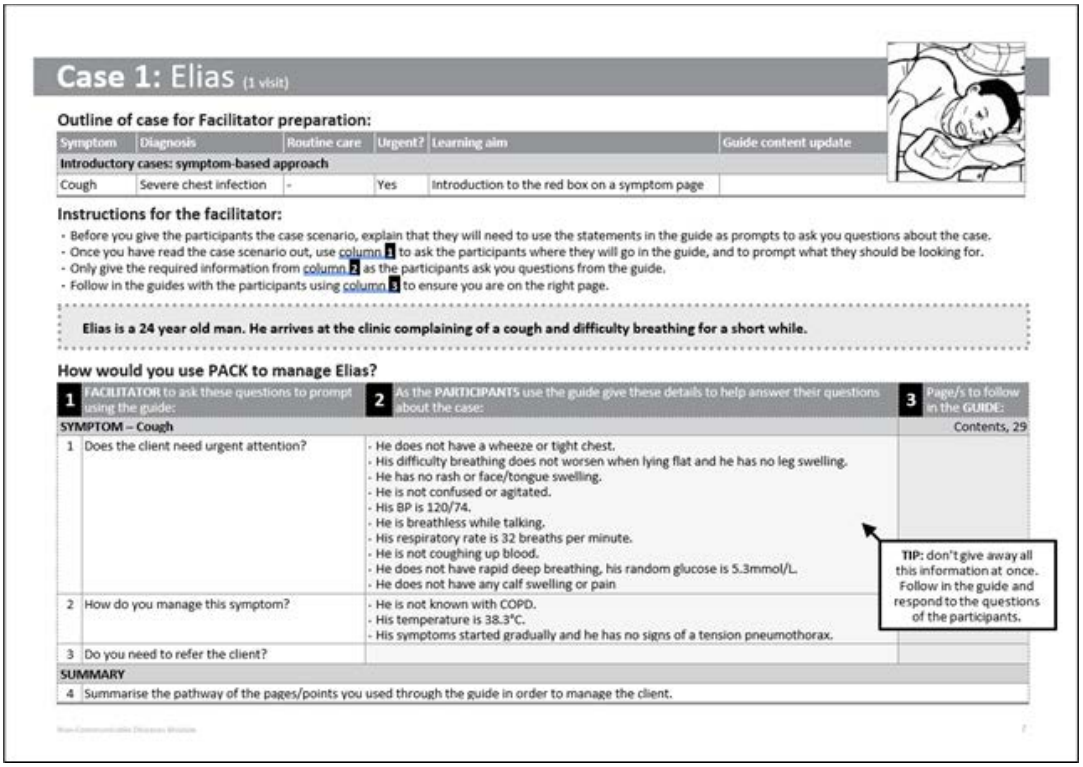
PACK training has traditionally been delivered via a cascade model: the KTU trains provincial and district level Master Trainers to run facility trainers' workshops. The aim was for each facility to have its own PACK trainer. This Facility Trainer is equipped with a standardised approach to each training session, including the use of a case template and

facilitations skills. The Facility Trainer is responsible for delivering group training sessions onsite at the clinic, monitoring staff completion and reporting.

PACK training methodology is very different to a didactic, lecture-style learning experience. Group interaction is generated by the trainer using a carefully constructed case template (Figure 2.1) to facilitate a session with a small group of participants, applying adult education principles (Figure 2.2) (Simelane *et al.*, 2018). This is a very practical session - each participant is required to have their PACK guide open in front of them and the interaction aims to embed an approach to accessing the content which is standardised and yields reliable results. The trainer reads out a patient case scenario and then asks the participants questions to replicate the process of a consultation in PHC.

See a video of the PACK training in action: https://youtu.be/b1fgr7pCYJAs
Access the print PACK Adult guide: https://knowledgetranslation.co.za/download/8917
PACK Adult eBook: https://knowledgetranslation.co.za/download/8920

Figure 2.1: PACK face-to-face training case template



Case 1: Elias (1 visit)

Outline of case for Facilitator preparation:

Symptom	Diagnosis	Routine care	Urgent?	Learning aim	Guide content update
Introductory cases: symptom-based approach					
Cough	Severe chest infection	-	Yes	Introduction to the red box on a symptom page	

Instructions for the facilitator:

- Before you give the participants the case scenario, explain that they will need to use the statements in the guide as prompts to ask you questions about the case.
- Once you have read the case scenario out, use column 1 to ask the participants where they will go in the guide, and to prompt what they should be looking for.
- Only give the required information from column 2 as the participants ask you questions from the guide.
- Follow in the guides with the participants using column 3 to ensure you are on the right page.

Elias is a 24 year old man. He arrives at the clinic complaining of a cough and difficulty breathing for a short while.

How would you use PACK to manage Elias?

1 FACILITATOR to ask these questions to prompt using the guide:		2 As the PARTICIPANTS use the guide give these details to help answer their questions about the case:	3 Page/s to follow in the GUIDE:
SYMPTOM – Cough			Contents, 29
1	Does the client need urgent attention?	- He does not have a wheeze or tight chest. - His difficulty breathing does not worsen when lying flat and he has no leg swelling. - He has no rash or face/tongue swelling. - He is not confused or agitated. - His BP is 120/74. - He is breathless while talking. - His respiratory rate is 32 breaths per minute. - He is not coughing up blood. - He does not have rapid deep breathing, his random glucose is 5.3mmol/L. - He does not have any calf swelling or pain	
2	How do you manage this symptom?	- He is not known with COPD. - His temperature is 38.3°C. - His symptoms started gradually and he has no signs of a tension pneumothorax.	
3	Do you need to refer the client?		
SUMMARY			
4	Summarise the pathway of the pages/points you used through the guide in order to manage the client.		

TIP: don't give away all this information at once. Follow in the guide and respond to the questions of the participants.

The case template ensures the trainer follows the information correctly and reaches learning outcomes. Group interaction is intentionally built in by applying adult education principles (Simelane *et al.*, 2018) so that the group, not the trainer, provides information and content from the guide, and uses structured discussion points in answer to the trainer's questions.

Figure 2.2: PACK application of adult education principles

2.7.1 Moving PACK face-to-face training to an e-learning format:

The challenge of how to avoid compromising on the quality of the PACK face-to-face training by using some of the limited e-learning options available was a critical factor in decision-making during early development of the learning materials i.e. how to digitise the cases without losing the interactivity of the programme found in the face-to-face sessions. Thus, the e-learning cases were created using a design-based research framework as a structure, with the intention of multiple cycles of design and evaluation between 2016 and 2018 (Amiel & Reeves, 2008)

There were limited technical and design options available for offline use that could accommodate an element of interactive learning experience. Available mechanisms in the DOH for access to e-learning could not support interactivity without funding for an LMS. After much research, the decision to use an interactive PDF format was taken, particularly as this could be distributed via an external USB drive and would not require internet access, and the established training cascade could support a blended learning model. The PDF was thought to require fewer graphic design hours than other options at the time and would function on DOH computers in clinics without requiring much updating or additional input from external sources.

The original Mental Health module PDF was developed and introduced to a working group for initial and feedback in two clinics in November 2016. Focus group discussions and review of the module occurred in January 2017, which informed refinement of the case format. This took place over several months.

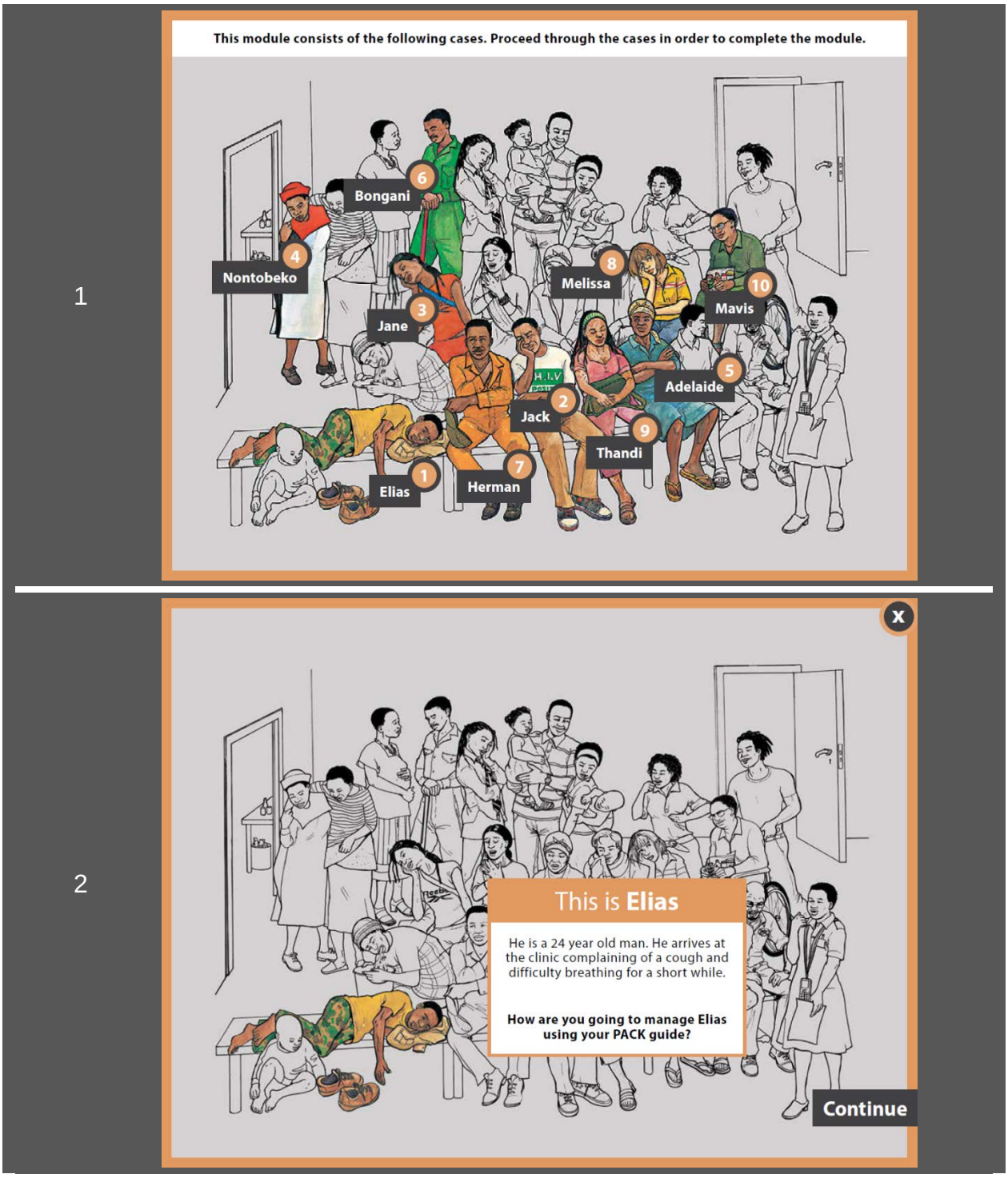
A literature review suggested some draft design principles which helped to inform the design of PACK e-learning. Addendum 1 offers principles and potential applications to the PACK e-learning cases, which were tested and refined as part of this study. Applying situated learning theory to PACK e-learning training was achieved using the Herrington & Oliver (1991) critical characteristics for situated learning instructional design. It should be noted that these characteristics were all fulfilled in the face-to-face facilitation of cases. The characteristic as described by the authors as well as an example of an application in

PACK e-learning cases is detailed in Addendum 1: Situated learning characteristics of PACK e-learning.

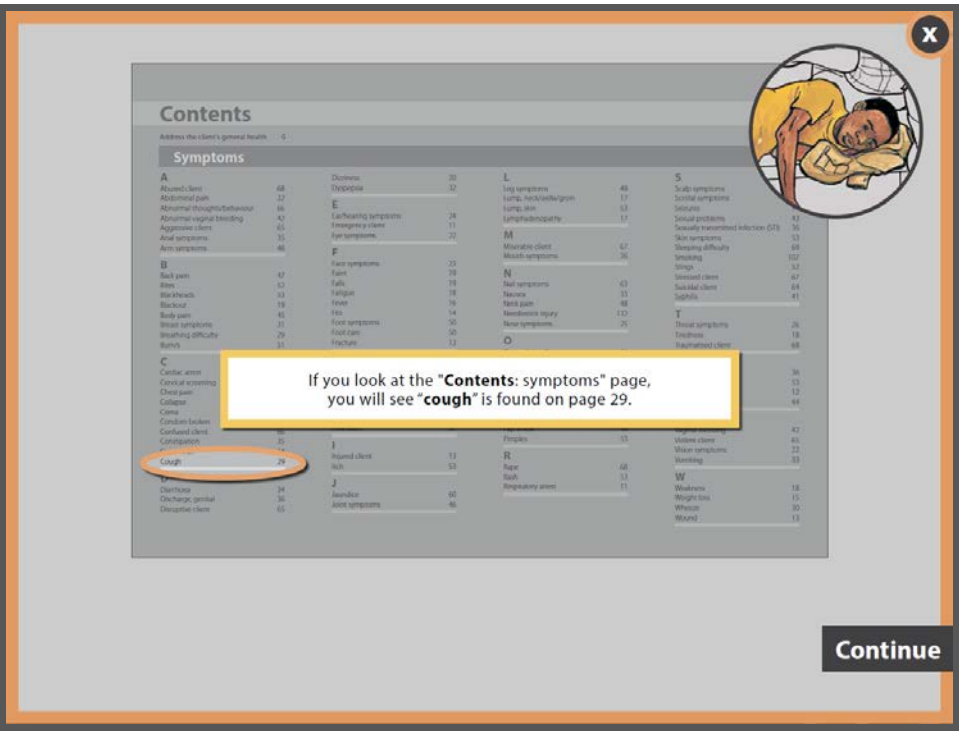
The clinical content of the module was updated to align with the latest PACK guide content (revised annually) and circulated to the PACK Master Trainer network again towards the end of 2018.

The instructional and extensive graphic design of the PDF ensured the ‘voice’ of the facilitator was present in the asking of questions and instruction giving. Participants were required to indicate answers using ‘buttons’ in tick boxes, and yes/no and multiple-choice blocks, to progress. When they answered incorrectly, they were given the option to review the reason for this in a wrong answer explanation box. The image of the guide page was used continuously as a reference point but was small enough to ensure the participant would have to physically use the hard copy guide to follow the cases. Correct answers were highlighted or supplied to ensure that this activity usually performed by a trainer was not lost. Figure 2.3 shows examples of these features: screen 1 shows the waiting room scene, a familiar PACK narrative tool used to tell the story of the patients in the module; screen 2 identifies the patient requiring assistance and describes their case briefly; screen 3 shows an answer box (in yellow), screen 4 and 5 are examples of the interactive yes/no or multiple choice question boxes (in orange), screen 6 shows the wrong answer explanation, screen 7 identifies discussion points for the case and screen 8 summarises the case.

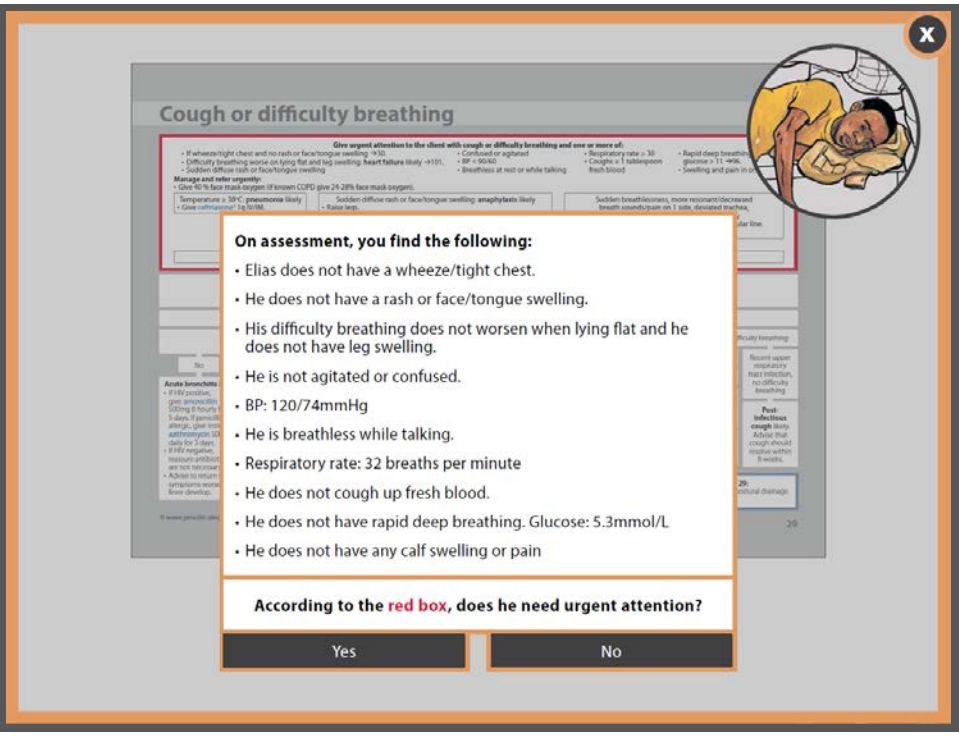
Figure 2.3: Screenshots illustrating the features of a PACK e-learning case PDF



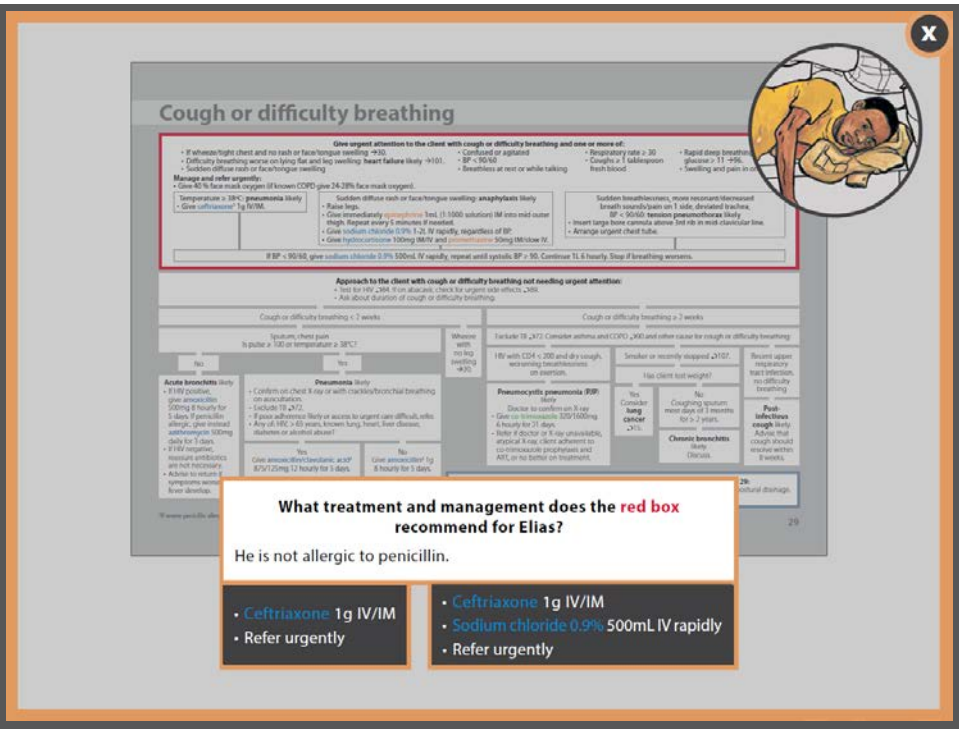
3


Contents
Symptoms
If you look at the "Contents: symptoms" page, you will see "cough" is found on page 29.
Continue

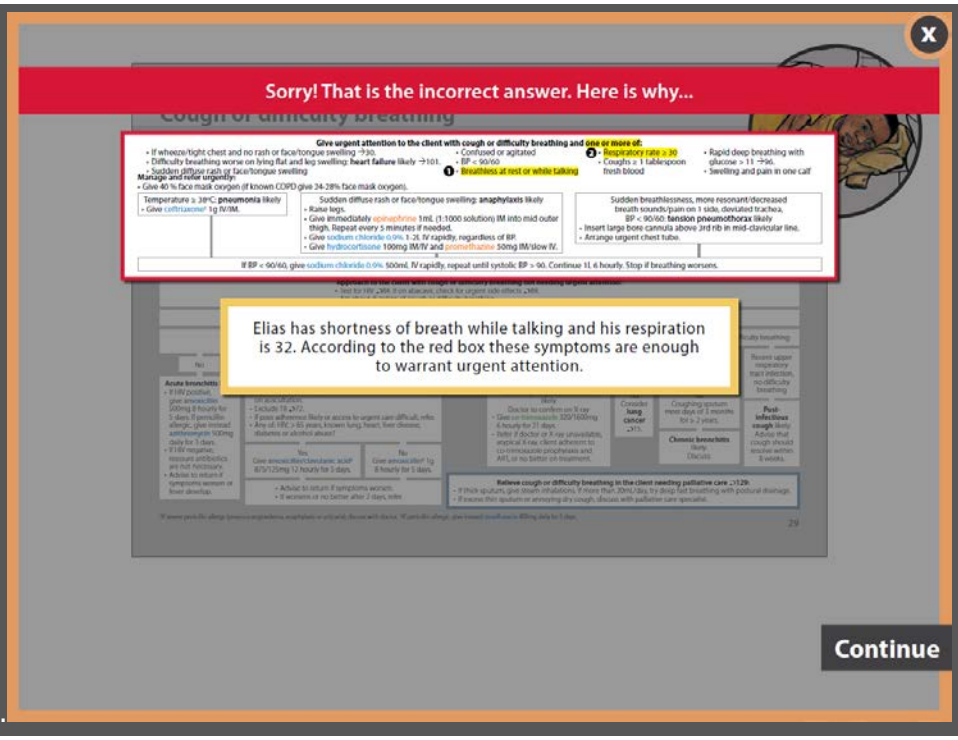
4


Cough or difficulty breathing
On assessment, you find the following:
• Elias does not have a wheeze/tight chest.
• He does not have a rash or face/tongue swelling.
• His difficulty breathing does not worsen when lying flat and he does not have leg swelling.
• He is not agitated or confused.
• BP: 120/74mmHg
• He is breathless while talking.
• Respiratory rate: 32 breaths per minute
• He does not cough up fresh blood.
• He does not have rapid deep breathing. Glucose: 5.3mmol/L
• He does not have any calf swelling or pain
According to the red box, does he need urgent attention?
Yes
No

5


Cough or difficulty breathing
What treatment and management does the red box recommend for Elias?
He is not allergic to penicillin.
• Ceftriaxone 1g IV/IM
• Refer urgently
• Ceftriaxone 1g IV/IM
• Sodium chloride 0.9% 500mL IV rapidly
• Refer urgently

6


Sorry! That is the incorrect answer. Here is why...
Elias has shortness of breath while talking and his respiration is 32. According to the red box these symptoms are enough to warrant urgent attention.
Continue

7

Let's talk...

Please discuss the following with a colleague or take a moment to think it through on your own:

Which other staff members might benefit from being introduced to the case of Elias in your clinic?

Consider sharing this information with your security guards, cleaners and clerks as they are often the first contact for patients.

When a client comes in with obvious signs of needing urgent attention, how can you act quickly but also use the PACK guide to ensure that you give him the best care and do not overlook anything?

Consider familiarising yourself with the red boxes in the PACK guide that deal with the emergency situations you encounter most in your clinic.

Continue

8

What did you learn from this case?

Case summary

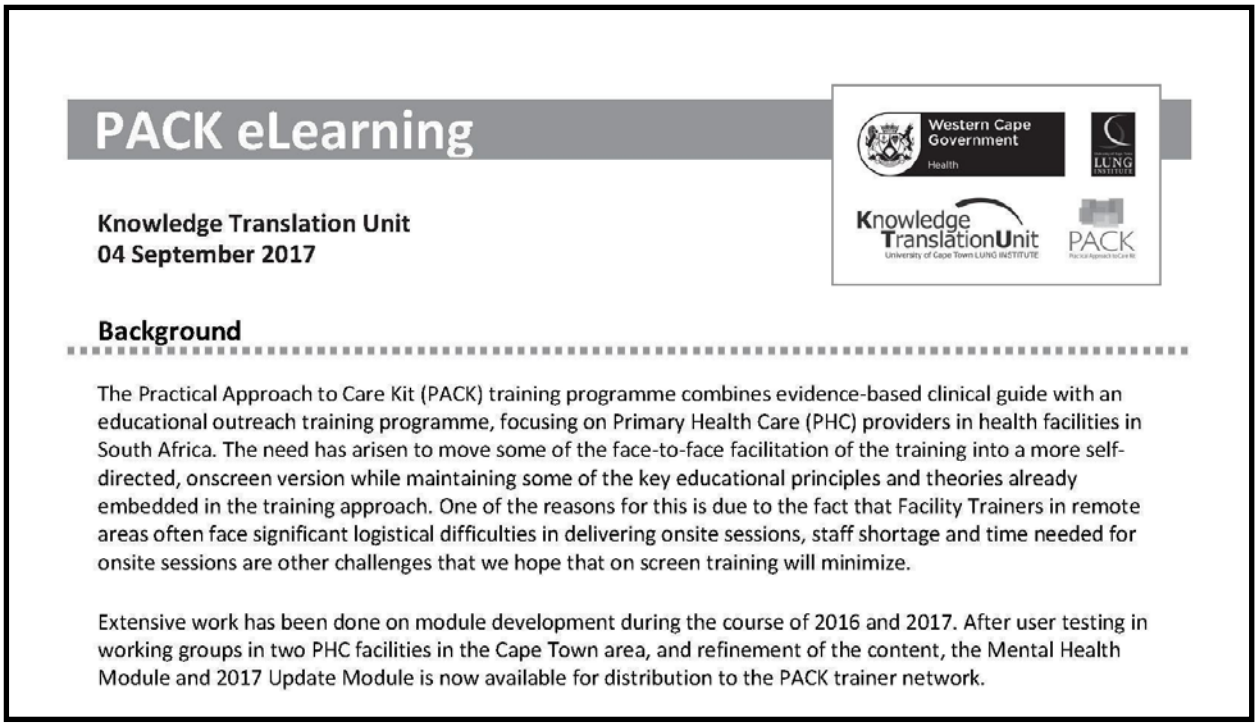
Symptom
Cough/difficulty breathing
Diagnosis
Pneumonia
Learning aim
Introduction, contents page, red box

Well done for treating Elias. Who is your next patient »

2.7.2 How PACK eLearning was introduced:

Master trainers joined a workshop at the KTU offices in which the e-learning process was explained, they then met with their facility trainers to introduce the e-learning training option. Explicit attention was given to the blended learning approach and the expectation of continued face-to-face interaction and support provided by the Facility Trainers i.e. application of the community of practice theory (see instructions provided in Figure 2.4. below). The Mental Health module also contained two familiar, non-mental health cases usually used at the beginning of PACK training to orient participants to the e-learning training approach with familiar content. During the initial introduction of the PACK e-learning module, it was referred to as “on-screen” because it was delivered digitally (on a computer screen) but not connected to the internet or LMS. At the time it was preferable to use this term in the nursing training context for clarity, as the term e-learning created confusion in terms of functionality. For the purposes of this study and clarity overall, the term e-learning replaces on-screen learning.

Figure 2.4: Blended learning instructions supplied to Facility Trainers for PACK e-learning



PACK eLearning

Western Cape Government Health

LUNG INSTITUTE

Knowledge TranslationUnit University of Cape Town LUNG INSTITUTE

PACK

Knowledge Translation Unit
04 September 2017

Background

The Practical Approach to Care Kit (PACK) training programme combines evidence-based clinical guide with an educational outreach training programme, focusing on Primary Health Care (PHC) providers in health facilities in South Africa. The need has arisen to move some of the face-to-face facilitation of the training into a more self-directed, onscreen version while maintaining some of the key educational principles and theories already embedded in the training approach. One of the reasons for this is due to the fact that Facility Trainers in remote areas often face significant logistical difficulties in delivering onsite sessions, staff shortage and time needed for onsite sessions are other challenges that we hope that on screen training will minimize.

Extensive work has been done on module development during the course of 2016 and 2017. After user testing in working groups in two PHC facilities in the Cape Town area, and refinement of the content, the Mental Health Module and 2017 Update Module is now available for distribution to the PACK trainer network.

Implementation

The cases are in an interactive PDF format, and will require the use of a computer. The clinical content that is covered through the onscreen cases will be the same as the content covered in the paper-based modules delivered by Facility Trainers, and a certificate will be given on completion of the module as with the paper-based modules. They are not yet linked to a Learning Management System and will still be recorded using paper-based training records.

This training follows a blended learning approach and combines self-directed and facilitator-directed learning, as completion of the module requires completing the on screen cases and engagement with the Facility Trainer at regular intervals. The Facility Trainer will confirm and sign off module completion and submit the training records to the KTU.

Implementation will follow the People Development Centre selection criteria for which participants can take part in this eLearning initiate, these criteria include:

- Being Independent
- Being a self-directed person
- Ability to relate to peers collaboratively
- Ability to embrace technology

Framework for Onscreen module completion

**Note the number of cases per session will vary per module. The framework below uses the Mental Health Module as an example.*

Session 1:

- Facility Trainer meets with staff, introduces module and ensures completion of pre-training Mental Health assessment.
- Facility Trainer explains use on computer, completing one as a group, with discussions. This is preferred but not essential as the module has built in explanations, and initial users found the technology relatively easy to use.
- Training record completed.

1

How to save from a memory stick

1 Plug in memory stick. Wait for the memory stick to read or go to 'my computer' to open it.

2 Once open, click on the file to drag to desktop.

3 Open the file from the desktop NOT from the memory stick.

4 You can press ctrl on your keyboard pdf fullscreen. Use the buttons on the p NOT SCROLL.

Clinic staff then complete a further 3 cases at their own pace, alone or in groups, using the PACK guide with patients in between to consolidate learning. Each case contains specific discussion points, thus encouraging collaboration and sharing amongst colleagues either during the case or afterwards.

Session 2:

- Meet with the Facility Trainer again for check in, discussions, questions and case summaries.
- Do one case together to confirm familiarity with content and assess learning needs.
- Clinic staff then complete the balance of the cases at their own pace, alone or in groups and are encouraged to share with their colleagues and discuss specific points about the case.

Session 3:

- Summary of the module by the Facility Trainer
- Post assessment
- Finalisation of training records and submission for certification
- Training records will be the same as the standard paper-based records, only an individual training record is needed and it must be clearly marked with ONSCREEN at the to p of the page.

2017 Update Module

- The Update Module is only 6 cases and there is no pre and post training assessment, therefore session 2 can be omitted.
- The Update Module is also being used for the Doctors PACK training.

Help and troubleshooting:

Please be in contact with your Master Trainer for assistance or queries; alternatively send a query to www.knowledgetranslation.co.za/feedback. We would love your feedback on your experience with PACK eLearning.

2.8 Conclusion

Chapter two provided an overview of global and southern African literature for the topic of in-service e-learning for nurses and other health professionals, and identified access to technology, digital literacy, work setting, teaching and learning approaches and mobile technology as areas of interest in this context. This information provides an understanding of the global and more local context and helps to inform questions about the experience of the PACK e-learning module and analysis of the findings.

The theory of situated learning in communities of practice was explored as a lens with which to examine PACK e-learning. Drawing on the original PACK training design, the literature review and theoretical framework, the PACK e-learning cases were designed in an interactive PDF. A blended learning approach aimed to provide for e-learning and facilitator-led interaction and to feature situated learning principles.

3. Research methodology

3.1 Introduction

This study aims to understand on-the-ground evidence of trainers' and nurses' experience of using educational technology as part of the PACK training package. It does this through qualitative in-depth interviews with trainers, nurses, and Department of Health stakeholders. This chapter describes the research approach undertaken in this study and includes information about the study population and setting. The choice of methods is explained and described. This methodology includes criteria for the choice of participants, what was done and with whom. The chapter also describes how the data collected was analysed. Validity, ethical issues, and limitations of the study are outlined.

3.2 Research orientation

This study adopts an interpretivist approach because it aims to understand and explain how trainers and nurses use on-screen learning materials and approaches it from the perspective that trainers' and nurses' experiences in this regard are subjective (Cronje, 2005). A conceptual framework should be made up of relevant themes and ideas informed by the literature reviews combined with a theoretical approach that can explain the phenomenon being researched. Clearly defining the research paradigm offers a clear standpoint, guiding and defining design decisions (Maxwell, 2009). Interpretivism focuses on people's subjective experiences, on how people "construct" the social world by sharing meanings, and how they interact with or relate to each other. Therefore, knowledge is personally experienced rather than acquired from or imposed from outside. It is these personal experiences that are explored in this thesis. The knowledge comes from various viewpoints that are explored here. The interpretivist research paradigm is built on the premise that reality is multi-layered, and experiences can be interpreted in different ways (Ryan, 2018).

3.3 Qualitative approach

To examine the complex and specific context in which PHC nurses are required to use and le-learning, a qualitative case study research design was used. To get multiple views from the different actors involved, a total of nine in-depth interviews were completed with participants across the cases from the setting under study.

Qualitative case studies focus on coding or thematic analysis within a particular group or setting and this ensures the contextual lens is maintained (Maxwell, 2012). These were used in order to generate a rich description of trainers' and nurses' e-learning experiences within each specific clinic under study, and in order to potentially comment on any similarities or differences in these experiences across the clinics and within the stakeholder interviews. In a complex health system environment, case studies have the potential to contribute to the development and evaluation of interventions within health sciences research (Baxter and Jack, 2008). Case study research is used to study a unit or phenomenon within the context of its day-to-day, practical (Burns and Grove, 2009). It is valuable because they can provide descriptive data and explanatory information about the subject under study i.e. data on "what" and "why" (Brink, 2002) and in a complex health system environment, can contribute to the development and evaluation of interventions within health sciences research (Baxter and Jack, 2008).

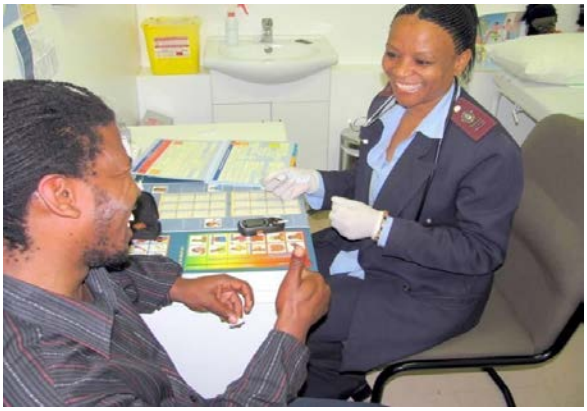
Using case studies (Yin, 2003 in Baxter and Jack, 2008) offers the opportunity to understand the experiences of PACK trainers and nurses in (two) different locations, as well as the overarching policy environment in which this training takes place via the stakeholder interviews. The clinic circumstances are similar in terms of the health system but the choice of a multiple case studies provides a space to understand how each clinic functions in relation to e-learning, what the potential similarities and differences might be - and how this data might influence the development of e-learning resources in this context in the future.

3.4 Selection of site and participants

The setting for this study is two Primary Health Care (PHC) facilities serving impoverished peri-urban communities in the Western Cape province, South Africa. PHC clinics provide general care to children, women, and men as well as specific services related to Tuberculosis (TB), Human Immunodeficiency Virus (HIV) and Sexually Transmitted infections (STIs).

The population under study was PHC staff, particularly nurses, who are eligible for PACK training and may use PACK as part of their scope of practice. This therefore required study participants to be Professional Nurses (PN) who had completed a four-year nursing Diploma or Degree, Clinical Nurse Practitioners (CNP) who had completed an additional postgraduate year of study specialising in PHC, or Medical Officers (MO). The population included PACK Facility Trainers (who are also PHC staff), as well as key stakeholders in the Department of Health responsible for the implementation of PACK training in the Province.

Image 2: A clinic nurse using PACK during a consultation



To highlight any systems issues that might impact implementation of e-learning modules, purposive sampling aimed to ensure that the clinics represented sites with varying degrees of management and doctor support, facility size and human and financial resources (Green and Thorogood., 2009). Similarly, purposive sampling aimed to identify nurses who have had solid but varying exposure to face-to-face PACK training prior to being introduced to the e-learning module, as well as representing as broad as possible age and gender range. A total of nine in-depth interviews were conducted: Five nurses, two trainers and two key stakeholders were interviewed.

The defining inclusion criteria was that the participants should be either a Professional Nurse (PN), Clinical Nurse Practitioner (CNP) or medical officer (MO) using the PACK training package, as this group is the main target group of the training intervention. This group may include facility managers and facility trainers. Exclusions for this study were other cadres of health workers, who might be exposed to the training but who were not eligible to fully utilize all the recommendations in the guide.

3.5 Recruitment

The initial research plan aimed to sample three to four clinics with at least one being a rural example, each with one trainer and at least two nurse interviews per clinic (see Challenges below). Participants were recruited based on the following factors, in

consultation with the Department of Health training department, who run the PACK training in the province:

1. Their facility readiness to engage with the e-learning module/having completed the e-learning module
2. Their location (close enough to Cape Town to travel to for interviews)
3. Their willingness and availability

Once data on facilities that fulfilled these criteria were identified, a formal process of application to the Health Research Committee was undertaken to gain access to facilities via the correct Department of Health channels of communication. This application process required the research committee to make enquiries via health managers to establish availability of clinics to cooperate with research, and then provide the researcher with a list of area managers to contact, who then gave written official permission for clinic managers to be contacted. These clinic managers then gave permission for the nurses to be contacted to request interviews.

3.6 Challenges

This process of permissions to conduct research was lengthy and challenging, particularly as this involved pragmatic real-world implementation of an e-learning intervention by the Department of Health and not as part of a large research project. As each layer of enquiry was time-consuming and dealt with individuals who were under enormous pressure to provide a health care service on a day-to-day basis, research requests were deprioritised at facility level even if ‘approved’ by more senior DOH departments. Communication systems in the health service are difficult to navigate as often clinic telephones remain unanswered, or requests to speak to staff are redirected to unanswered phones. This resulted in weeks of calls to secure a single interview, and even then, the interviews were often cancelled, or the incorrect candidates had been selected by DOH and the application procedure had to be recommenced.

Recruitment in this study was very difficult. All the clinic staff felt very pressured to get back to their duties, despite being ‘willing’ to provide time for interviews as the research had been approved. When interviews were eventually conducted, face-to-face visits were a challenge and some telephonic interviews were divided up into multiple calls because 40 minutes of free time was not available. One selected clinic declined to participate in interviews at all due to time constraints, and another clinic’s nurses were inappropriate candidates for recruitment as they were not involved in the e-learning roll out – this despite following the correct recruitment procedures and processes. Additionally, requests to sample rural clinics were denied and this is a limitation of the study.

To secure more interviews, another clinic was identified as eligible and the approval process was initiated via Department of Health channels only to find, months later, that the clinic was not in fact eligible and had not been exposed to the e-learning cases. This resulted in a shortage of data for the study and prompted the decision to interview Department of Health staff responsible for the planning and implementation of the PACK training in the province as another ‘case’.

As a result of the above challenges, the time lapse between initial exposure to the e-learning cases was longer than ideal and required participants to think back to their experiences, possibly forgetting details from over 12 months previously in one clinic. Linked to this, the KTU underwent a change in the contractual relationship with the Western Cape Department of Health which included handing over the monitoring of all PACK-related activities to the training department. This resulted in the loss of the opportunity to monitor the use of the e-learning cases in any detail, and this information was not required by the DOH nor were they obliged to provide it to the KTU.

3.7 Description of cases

Department of Health stakeholders:

The two Department of Health training department stakeholders were included in the study to offer a contextual lens through which to view the cases. This was due to limited access to further cases (clinics) to include as participants and lies outside of the traditional case study design. While the KTU had a close working relationship with this department over a period of years during the development and implementation of PACK, the data included in the findings chapter was reserved to interview specific responses.

The inclusion of only two participants from the DOH, and from a well-resourced province in South Africa, limits the generalisability of their feedback.

Clinic 1 Description: As a PACK trainer of trainers, the researcher had met the trainer of Clinic 1 once as part of a workshop but did not know her well or have any contact with her on an ongoing basis. The clinic was entirely unknown to the researcher as was the context or clinic nurses. Any descriptions or data herein were gleaned as part of the interview process or engagement with the DOH to gain access to the clinic and nurses. None of the participants in this case were met face-to-face during the research period, despite requests to do so.

Clinic 2 Description:

The researcher had met Clinic 2's trainer numerous times over a period of 8 years during PACK related workshops but had no contact with her outside of these intermittent engagements. None of the nurse participants were known to the researcher, nor was the clinic itself. The local DOH training department offices were visited for the trainer interview and Clinic 2 was visited three times for the purposes of the research interviews. In case No.2 again, information included was reserved to interview and visit data (audio and observations).

3.8 Methods of data collection

The candidate conducted the interviews with all participants. A semi-structured interview guide was used to conduct in-depth qualitative interviews. Interviews began with introductory questions to establish knowledge of general computer literacy (ability to use computers including MS office suite, email) and smartphones (including use of Apps like WhatsApp, Facebook), access to technology and infrastructure (at home and at work). Questions then explored how nurses were introduced to the e-learning material and how they described their learning experience, probing for any challenges related to content, technology or systems/infrastructure, or other reasons (see Addendum 2).

3.8.1 Data Collection

Interviews were conducted between December 2018 and December 2019.

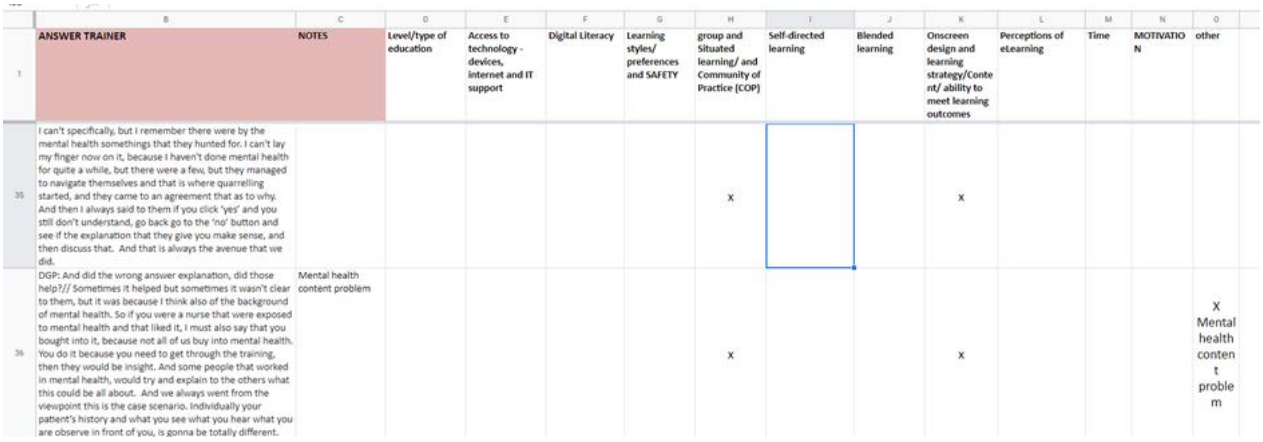
Table 3.1 Data collection summary

Participant	Interview time	In-person/phone call
Department of Health (DOH)		
DOH1	73.00 min	In-person, at KTU office
DOH2	48:02 min	In-person, at KTU office
Clinic 1 (C1)		
Trainer (C1T)	12.24 min 22.37 min	Phone calls
Nurse 1 (C1N1)	20.46 min	Phone call
Nurse 2 (C1N2)	19.35 min	Phone call
Clinic 2 (C2)		
Trainer (C2T)	55.31 min	In-person, at office
Nurse 1 (C2N1)	24.16 min	In-person, at facility
Nurse 2 (C2N2)	25.06 min	In-person, at facility
Nurse 3 (C2N3)	07.24 min 33.02 min	In-person, at facility
TOTAL: 340.23 min (5,7 hours)		

3.9 Data analysis

All qualitative interviews were audio-recorded and transcribed verbatim. An initial coding list was developed based on the background literature review, the theory of situated learning in communities of practice, as well as areas of interest emerging from training work in the KTU i.e. questions around how learning takes place in this context and the factors affecting uptake. Interviews were printed and initial data were coded thematically by hand, and a list of codes was developed for application to subsequent data.

An Excel spreadsheet was created for the purpose of capturing the coding of interview transcripts. Each interview question and its answer across all respondents was copied into the spreadsheet and then coded within the spreadsheet again (see Figure 3.1). The coding list was developed and refined as data analysis continued and formed the basis for drawing out key issues and themes. Introductory questions were analysed with the aim of describing the sample population's computer literacy and access to information technology, amongst other factors. For example, for the research question examining digital literacy, one of the interview questions was *"Do you know how to use a computer or laptop?"* The code applied to the response was **digital literacy**, and depending on the extent of the response, **access** was often another code assigned. The responses under the various codes were summarised into themes in the findings chapter.



	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	ANSWER TRAINER	NOTES	Level/type of education	Access to technology - devices, internet and IT support	Digital Literacy	Learning styles/ preferences and SAFETY	group and Situated learning/ and Community of Practice (COP)	Self-directed learning	Blended learning	Onscreen design and learning strategy/Content/ ability to meet learning outcomes	Perceptions of eLearning	Time	MOTIVATION	other
35	I can't specifically, but I remember there were by the mental health somethings that they hunted for. I can't lay my finger now on it, because I haven't done mental health for quite a while, but there were a few, but they managed to navigate themselves and that is where quarrelling started, and they came to an agreement that as to why. And then I always said to them if you click 'yes' and you still don't understand, go back go to the 'no' button and see if the explanation that they give you make sense, and then discuss that. And that is always the avenue that we did.						x			x				
36	DGP: And did the wrong answer explanation, did those help?// Sometimes it helped but sometimes it wasn't clear to them, but it was because I think also of the background of mental health. So if you were a nurse that were exposed to mental health and that liked it, I must also say that you bought into it, because not all of us buy into mental health. You do it because you need to get through the training, then they would be insight. And some people that worked in mental health, would try and explain to the others what this could be all about. And we always went from the viewpoint this is the case scenario. Individually your patient's history and what you see what you hear what you are observe in front of you, is gonna be totally different.	Mental health content problem					x			x				X Mental health content problem

Figure 3.1: Data analysis spreadsheet

After this coding process an extract of each code was generated in a Word document and summarised, together with illustrative quotes. The iterative process of further analysis, grouping of data and discerning of themes was followed over time, with supervisor support, until the findings chapter was completed.

3.10 Validity

Maxwell (2009) describes an approach to the qualitative research study that requires the researcher to identify potential challenges to the validity of the study. He suggests researcher self-awareness and honesty about preconceived ideas and beliefs around the topic under study (i.e. bias). These values cannot be removed or controlled for but can be explained as needed. He also describes how the researcher will have an influence on the study simply by being one of its components – here again it is important to understand this influence and describe it openly i.e. it is important not to avoid the concept of reactivity. The reliability and validity of the data in this study was enhanced through the exploration and elaboration of differences and similarities across the cases and the ongoing discussion of emerging findings with supervisors and colleagues, and key themes are illustrated with extracts from the data as appropriate (Maxwell, 2009).

Attempts to ensure the findings of this study are trustworthy have been made by systematically following the research process and the researcher has been mentored by an esteemed colleague in the field of educational technology. Any and all resources are accurately and honestly referenced in-text and in the list at the end of the dissertation using the Harvard University of Cape Town style.

3.11 Ethical considerations

Ethical consent for this study was obtained from the University of Cape Town Humanities Ethics Committee, and the Faculty of Health Sciences Human Research Ethics Committee, as was the necessary approval from the relevant provincial structures in the Department of Health. Permission was then requested from the relevant health authorities

and clinic managers for research in selected clinics. Participants were initially approached telephonically by the researcher to participate in the study and to discuss consent. Formal written consent was obtained by the researcher on the first day of face-to-face contact or discussed telephonically and then emailed written consent forms were exchanged. Participants were provided with a detailed information sheet and asked for their signed informed consent. These forms were provided in English, the language in which onscreen cases are presented, and interviews were conducted. Consent for audio-recording was also requested. It was made clear to participants that if they were uncomfortable with any aspect of the research, they were free to withdraw from the study. To protect the confidentiality of participants, all transcript data was rendered anonymous. Following transcription, data analysis and write-up, all original audio-recordings will be destroyed.

3.11.1 Potential harms and measures to protect from harm

The study did not pose any risk to the participants. Participants' use of the PACK guide in their clinical practice aligns with National Department of Health policies and guidelines for disease management, including prescription of medication. Interviews were scheduled to avoid disruption of facility function and patient care was not interrupted or compromised. Patient care at clinics was not at risk as the PACK guide is based on the best available evidence, is consistent with national recommendations and is used only by experienced health practitioners. All research related costs were covered by the researcher.

Participants were not paid for taking part in this study. The study will benefit participants to improve their individual approach and management of clinical cases according to up-to-date evidence-based guidelines. For those completing the module as instructed, a certificate of completion was awarded after Facility Trainer was satisfied that cases and pre-/post tests were successfully completed. The study has broad public health benefits in promoting more effective training for nurses and promoting improved delivery of care. The study adheres to the Declaration of Helsinki 2013 (World Medical Association, 2013).

3.11.2 Researcher role

In this research I fulfilled the role of developer, implementer and researcher and attempted to balance this role. I attempted to guard against subjectivity because of my work role and did not benefit from any preferential treatment as I participated in the same formal processes to gain access to participants, and it remained very difficult to conduct the research.

I had worked closely with the Department of Health for years during the development and implementation of PACK face-to-face training and was known to some of the stakeholders identified for interviews. The other participants were also made aware that I was from the PACK team, and it may be that participants chose not to reveal certain information because of this. Participants did understand the developmental nature of the research, and that their honest responses would ultimately feed back into the PACK programme. As is evident in the findings chapter, participants appeared to be open about sharing their difficulties and making suggestions.

An advantage of this role was being able to adjust the e-learning approach in an agile manner during development based on feedback, as well as understand the weight of contextual factors influencing learning, ultimately contributing to the advancement of the PACK e-learning approach.

4. Findings

4.1 Introduction

The findings below include data from interviews with Department of Health (DOH) stakeholders, trainers, and nurses in two clinics which were exposed to the PACK e-learning module (Table 4.1). The chapter begins with the views of the DOH stakeholders, their vision for the PACK module and towards using e-learning materials, as well as a description of the technological infrastructure and availability and use of computers at the clinics. The rest of the chapter is divided into sections that describe the strategies and experience of the PACK Trainers and nurses who participated in this training program. The headings are structured based on the iterative process of data analysis described in Chapter 3, with themes arranged to address the research questions where possible - often emerging from the perspective of both the trainer (teacher) and nurse (learner). The findings give us important empirical data on the perceptions and beliefs of trainers and nurses with regards to their PACK e-learning learning experience.

Table 4.1: Participants in this study

	Age, (all female)	**Education**	**Position**
Department of Health (DOH)			
DOH1	40	4-year Nursing degree at University, post-graduate diploma (PG Dip) Primary Health Care (CNP)	Provincial Clinical training manager
DOH2	50	4-year Nursing diploma at college, PG Dip Primary Health Care (CNP)	Provincial training coordinator for HAST and PACK
Clinic 1 (C1)			
Trainer (C1T)	37	6-year Medical degree at University, MBChB graduated 2005.	Medical officer (MO), PACK Trainer

	Age, (all female)	Education	Position
Nurse 1 (C1N1)	47	4-year Nursing diploma at college, with 30 years' experience. In-service training, no formal additional qualifications.	Senior Professional Nurse (SPN) of the clinic. Sees general patients and is the on-site clinic manager as the Facility manager is off-site.
Nurse 2 (C1N2)	28	4-year Nursing diploma at Nico Malan College (CPUT), graduated 2014. In-service training, no formal additional qualifications.	Professional Nurse (PN) seeing children and adults. Focus areas are nutritional supplements, vaccination, family planning, STIs, HIV testing and TB.
Clinic 2 (C2)			
Trainer (C2T)	52	Four-year Nursing diploma; PG Dips in Nursing Education, Nursing Management, and Primary Healthcare, Stellenbosch University	Substructure training coordinator for City of Cape Town, responsible for in-service training of 6 clinics.
Nurse 1 (C2N1)	37	Four-year Nursing Diploma, Western Cape College of Nursing, postgraduate ICU and Primary Healthcare Stellenbosch University.	TB Nurse, Clinical Nurse Practitioner (CNP)
Nurse 2 (C2N2)	32	Four-year Nursing Diploma, Western Cape College of Nursing 2009-2012, no postgraduate studies	General nurse
Nurse 3 (C2N3)	30	Four-year Nursing diploma, Cape Peninsula University of Technology (CPUT) 2009 – 2012; Diploma Primary Health Care CPUT in 2017; enrolled in Public Health Diploma at University of Western Cape (UWC).	Basic Antenatal Care (BANC) nurse

4.2 Department of Health stakeholders

The two Western Cape DOH stakeholders interviewed worked within the department responsible for clinical training for all health care professionals working within the DOH and Community Based Services (CBS).

Clinical training is done via internal development and training as well as through several service providers. The PACK programme has been implemented widely in a face-to-face training programme for PHC in the Western Cape and is *"used to integrate all other policies within the system"* (DOH2).

4.2.1 e-Learning vision

The DOH training department has explored options for e-learning since 2018 as part of its strategic planning. This is part of a larger directive in the DOH in general, not just their training department. External service providers (e.g. KTU and others) who provide educational resources for the DOH will be required to produce materials in multiple formats i.e. didactic, blended and online. This allows learners to choose their preferred method of learning, and function in a self-directed way. The hope is for most courses to offer multiple learning modalities to address issues of access, cost saving, staff shortages and flexibility in learning offerings currently available. The aim is to have a fully integrated learning management system (LMS), including a resource library, freely accessible to all DOH employees:

"There is a great need for online learning and not only instructional online courses but building in components like a resource library needed to provide with the training "(DOH 1)

"(it) would really provide flexibility... It might be the answer to a lot of our upskilling staff, that currently doesn't have the luxury of coming to a training, for instance face-to-face training that we are providing" (DOH2)

The need for a synchronous LMS as well as an additional, well-structured link to a facility-based mentorship for many of the online courses envisaged was also highlighted:

"If I want to send a question, I'm stuck here; someone that can actually guide me through" (DOH2)

"So, if we could link the PACK cases to that competency framework, we would have a much higher success rate" (DOH2)

4.2.2 PACK e-learning design, a blended approach and content choices

Neither DOH stakeholder had any concerns with the initial PACK e-learning design. They were satisfied that it maintained the case-based stepwise approach and the basic functionality of the e-learning cases worked in the PDF format. They recommended that a future e-learning design could include monitoring and evaluation and how to assess completion if a fully online LMS is not yet available. In the case of the initial roll-out of the PACK e-learning cases, completions were low or not well-reported/monitored and this was concerning. It was not clear why people had not completed the cases:

"So you had a handful of people that actually completed the Mental Health on screen; If you ask them, what do you think, why did people not buy into it. It's not really an answer to it; people just didn't do it" (DOH2)

For future consideration is KTU contribution to more DOH training department resources, as well as a reduction in the size of the PACK modules to focus on orientation modules and then competency modules, and integration of PACK online cases into multiple courses to ensure integration across health programmes:

"Build a resource centre or a resource library with all sorts of articles, many of whom KTU has written. Also, additional information about the World Health Organisation, or interesting facts and stuff. And then we start with a PACK introduction attendance-based thing, which should be quite quick and easy, and

then we build on the blended and more competence-based stuff that we can design later." (DOH1)

4.2.3 Blended learning approach

There was strong support for blended learning in health sciences, giving learners the opportunity to learn in settings they find comfortable i.e. either in groups or alone in their own time. There did not appear to be an impetus to move learning entirely online:

"So that is why we need to create this framework with multiple interventions that if you are someone that does not want to be trained by a nurse, then go online and do it, or go and sit in X's classroom and have a face-to-face session. Each and every institution or district can decide what and how they are going to use it" (DOH 1)

Concerns were raised around two main areas - access to computers and the internet:

"I feel the access might be an issue... but it will save time, it will save money. And like now, we are developing hardcore training materials; most of the time developing books, having to print; it will take out all that cost" (DOH2)

Access to technology, the internet and digital literacy varies significantly across different contexts in the health system. Most clinics have computers but numbers and access by nurses to these are limited. District offices and managers at clinic level are more likely to have easy access to computers and intranet, other computers may be in reception areas for data capture or in the pharmacy.

"For the Department of Health most of the facilities have at least two computers. One is in the manager's office, so people don't really have access, and then they have at least one or two at the reception areas, and some of them have one in the pharmacy area" (DOH2)

“Most of the nurses working on-site don't even have access to emails. Which is in itself a big problem, because you can't email them confirmations or certificates or nothing” (DOH1)

Plans to increase access to computers from facility to district level (including options for computer labs), were not clear and still require funding:

“We are busy with bigger people-development strategy which will have decentralized training units at district and site levels, which would mean then those decentralized training units would then later have computer labs. Learning hubs, that's the idea” (DOH1)

4.2.4 Internet and intranet

Internet and intranet access also vary, but overall is still very limited. Proposals to have e-learning available on the intranet have been considered, although approval and implementation of this process is complex due to restrictions on intranet use.

“I think there are a lot of issues with internet connectivity almost everywhere, because I don't think it has been established... currently, if you go on the internet, it is only the intranet that people can access. So not everyone has access to the internet” (DOH2)

“I think an easier way for us to at first access it would be through the intranet. So people would connect and then the course, or the content should be on the intranet rather” (DOH2)

An interesting perspective is that despite these constraints, with the right motivation, staff can ensure that e-learning takes place:

“If one clinic had a wonderful online experience because they've got internet access, operationally it will come back to the district office and that manager will then promote either Wi-Fi access or something for them, so that they can have

a similar learning experience, because we cannot solve operational constraints …. People operationally will figure out, if they really want it" (DOH1)

The financial implications of not only design of training interventions for e-learning, but the long-term day-to-day costs are still a challenge. Online learning on an LMS could potentially cut costs, but additional costs emerge as then the DOH would need to fund data costs and these stakeholders acknowledge that DOH does not have this funding:

"People will say you must give me the data, if you want me to do the training. You must give me the laptop, or the phone in order to do it... So I don't think we are there yet" (DOH2)

4.2.5 Human resources

The training department e-learning strategy or framework addresses some of the challenges of the cascade model popular in health training, issues related to training quality and fidelity, as well as selection and capacity of trainers and human resource (HR) implications overall.

"The fact that PACK is still very much a cascade model, people think it's labour intensive, it's not flexible enough doesn't promote access etcetera. So, with us designing this framework, it's changing things" (DOH1)

In the traditional PACK cascade model, staff sometimes leave their facilities for four days to be trained as trainers and then are at times allocated multiple facilities to train despite having core functions within their clinics.

"We have facilities where there is only one person that is in charge of the facility and rendering the service package of care. So that person has to leave the facility, which means they have to get people to work in her place. So it's also gonna save money if you can have the person trained on-site through the e-learning" (DOH2)

4.2.6 Concerns about completion: accountability, age and time management

Factors influencing course completion may include accountability or acknowledgement in key performance areas for DOH staff. Although the mandate for PACK training exists (the National DOH Ideal Clinic Initiative does require clinics to have a percentage of staff trained), e-learning may provide an opportunity to highlight this mandate and achieve greater coverage. Similarly, the DOH training department intends to include PACK in more interventions as a requirement, so that PACK training becomes increasingly essential for PHC staff.

> *"I think that discipline is the big thing that is lacking because there is no pressure that I need to complete; ... I had a lot of previous knowledge on it, and trying to enrol in that is maybe not challenging enough" (DOH2)*

Stakeholders mentioned concerns about resistance to e-learning from the older generation of nurses and how this may influence engagement with e-learning and the time to complete the PACK e-learning cases.

> *"So, I think with computers and technology, especially within the nursing field, we were not exposed that much. The only time we were sitting on our desktops, and we were too scared to go sit there, was when we were doing the stats, in the wards, and when we had to order medication and that was it." (DOH2)*

> *"I'm older, so I should also go with the old ways of how we do. I mean it's difficult for people to change to new ways . . ." (DOH2)*

The perspective that e-learning offers an opportunity to complete training in one's own time is fraught, because in-service training is viewed as forming part of work hours. However, for those who prefer learning alone, in quiet time, at home, e-learning may be a good option.

“So, I think the people that would benefit from it will be mostly the people that are driven and disciplined enough to do it in their own time” (DOH2)

“And I think sometimes it's just overwhelming, this whole face-to-face. It's a luxury if you can actually sit down with a facility of 6,7 people at a time, and complete one or two of the modules within 3-4 weeks; ... and it's even worse for rural; having to drive the distance, and the person that you supposed to train must now see patients, which must take priority” (DOH2)

In conclusion the stakeholders highlighted benefits of PACK and blended learning, but also described several barriers including access to devices and internet, cost and time.

4.3 Clinics:

Stakeholders shared what they felt were potential barriers to completing the PACK e-learning cases, but they lacked an understanding of the range of experiences or completion rates from clinic to clinic. This section provides a clear explanation of experiences of engaging with PACK e-learning aiming to address the research questions and are, clustered into the following themes: access to technology and digital literacy, introduction of e-learning, e-learning design, the potential of smart phones, perspectives on teaching and learning, and barriers specific to the success of the PACK training materials.

4.3.1 Access to technology and digital literacy

In Clinic 1 and 2, nurses had previous exposure to PACK face-to-face training and were experienced users of PACK. In Clinic 1, neither of the two nurses interviewed completed the Mental Health module. In Clinic 2, of the seven nurses who completed the e-learning module, three were interviewed.

4.3.2 Access to technology

Both C1T and C2T had direct access to laptops and computers as part of their daily work functions, and in their personal capacity. Access to computers in clinics varied for the nurses. In Clinic 1, C1N1 had a computer in her office, C1N2 did not have access on a day-to-day basis.

Clinic 2 had computers in the TB room, reception area and Employee Self Service (ESS) station in their small boardroom area. This is the computer available for e-learning for seven staff members:

"Yes, and we only have one computer that we could use for the same cases" (C2N3)

Both clinics had limited, restricted intranet access used for basic work-related duties e.g. work email and human resource (HR) activities like applying for leave. All the nurses had either a laptop or computer at home. All participants owned Smartphones and had personal access to the internet both on their Smartphones and on home laptops or computers. All the nurses at Clinic 2 used their phones for most of their digital interaction and, in the absence of more computers to access in the clinic, all were interested in phones as an option for e-learning.

The use of technology on a day-to-day basis is similar in both clinics. Both trainers use computers, laptops, and smartphones daily for work and personal purposes – accessing Department of Health systems for patient folders, monitoring and evaluation, supervision, and communication (email). They are also proficient in the use of the Microsoft Office suite.

The computer infrastructure in place in City of Cape Town clinics was established around the year 2000 and is used by clerks to open patient folders and record visits and test results. Basic computer literacy is a job requirement, and in-service training via the skills plan is available for this. Some nurses do use this system daily (e.g. the TB nurses, like

C2N1) but most others are not required to access the system daily, possibly contributing to a lack of digital literacy and confidence.

In Clinic 1, C1N1 has a computer in her office which she uses daily but C1N2 seldom has access to a computer and accesses it only weekly for HR-related functions. In Clinic 2, C2N1 uses a computer daily but C2N2 and C2N3 have no daily computer use, also only using it when needed for HR-related functions.

All participants, except for C1N1, use their laptops or computers at home– either for home administrative purposes, children's study needs or for movies and games, but do appear to make more use of their Smartphones. All participants except C1N1 use their Smartphones for communication, information, and social media e.g. WhatsApp, Facebook, Instagram, Twitter, Email, Calendar, Shopping, Google, Internet Banking.

4.3.3 Digital literacy challenges of e-learning

The C1T found the e-learning module simple and user-friendly but noted that as a medical officer and someone familiar with the content it may have been easier for her to navigate from a digital literacy perspective. Trainers were asked to identify clinics and nurses who would be able to complete the e-learning cases, as both digital literacy and access are known challenges. Clinics with ESS stations in use by nurses were identified as possible options.

The cases were delivered by C1T by loading them from a flash drive onto the clinic computer (this was the only way of disseminating it in the absence of open internet access in the clinic) and sat with the nurses as a group to explain their use on her own laptop. Using the introductory case, she showed them how to 'click through' the cases. The nurses seemed comfortable to do so after the introductory session, however, did not continue with the module on their own.

Lack of confidence to use computers was noted in Clinic 1. The trainer noted that for those staff members using computers on a day-to-day basis it may have been easier to complete the cases than those without access to computers, and that age may influence ability and confidence:

"… our work in general is not computer based; our work is clinical based. I think that there is still that element of intimidation of the computer" (C1T)

Nurse 2 felt similarly:

"Some of us we're not good with computers. So maybe to have a computer all the time, it gives us that confidence" (C1N2)

Despite the e-learning module containing explicit instructions for use, including pictures of how to use it, C1T felt that this could also be simplified, although she was not sure how. She was concerned users are afraid to use it on their own.

"… because I think sometimes when I'm there it seems simple, and then somebody might want to try it later and then suddenly they can't remember exactly how to do it" (C1T)

As in Clinic 1, there was a variation in digital literacy in the clinic, so when C2T introduced the e-learning cases she ensured she paired up confident computer users with those who were less confident, and made the cases seem more like a game by offering encouragement and a sense of competition amongst the group of seven staff members. C2T indicated that despite the simple explanations of how to use the cases embedded within the e-learning module, support is still required.

Exposure to e-learning at tertiary education level was variable, with some participants having completed entire courses and others just having had exposure to tests and readings provided online. The only two study participants who had had absolutely no e-

learning experience were C1N1 and C1N2, both of whom also did not complete the PACK e-learning cases.

4.3.4 A new blended learning approach

4.3.4.1. PACK e-learning design for teaching

The PACK e-learning module was implemented using a blended learning approach (see Figure 2.4), alternating between face-to-face training and e-learning, supported as part of the cascade training model.

Clinic 1 was familiar with PACK, having received PACK training in other modules from the trainer. C1T oriented her nurses to the e-learning module and did a case with them to ensure they knew how to continue in her absence. However, the intended follow-up sessions were not conducted by C1T despite her expressing a clear need for a blended approach that included face-to-face interaction, to provide support and engagement in the vast detail of the PACK guide. Clinic 1 nurses did not revisit the module after the initial introduction. Interestingly, C1T maintains a preference for the face-to-face training model with e-learning as a support but in saying so describes the exact curriculum design of the PACK e-learning module:

> *"So I think your paper-based person-to-person training should always be your gold standard, and then maybe just use e-learning as a supplementation type of a thing …" (C1T)*

Overall the design was able to echo the step-by-step flow of information provided in the PACK face-to-face training according to C1T. She did caution against her perspective though, with her own clinical expertise and digital literacy as caveats. She also had some concerns around the ability of nurses to follow the introduction to e-learning on their own, or to continue using it on their own even if it was introduced by a trainer. There was no clear advice on how to facilitate this, but the sense was that it seemed simple to her but perhaps might not be to others. She noted the design of the interface was purposeful in its familiarity and felt this was acceptable:

“Yeah, I felt like the layout of the cases should seem very familiar to the staff being trained, because it kind of looks like the guidelines set up. You know the flow diagram and that sort of thing” (C1T)

C1T was concerned that the level of detail contained in the cases was more suited to face-to-face interaction and required a trainer to deconstruct.

After C2T had shown a group of nurses how to complete the cases, the nurses were then able to show colleagues how to do so if they had missed the introduction. This approach allowed flexibility to catch up on cases alone if colleagues had gone ahead and to use time when it became available. None of the nurses followed an exclusively e-learning approach, all had a blended learning experience, and most completed the cases partially with other colleagues.

“I think it worked, but there should be someone who also … someone like C2T so that if we get problems, or questions, we can write them down and then communicate with C2T, even if it's via email just to get the answers“ (C2N3)

C2T ensured she revised the learning aims of the e-learning cases when she visited the clinic, as well as the blended learning approach instructions. This was useful particularly in cases where there may have been confusion or disagreement. She also checked that the discussion points embedded in the cases had been reviewed and if any further discussion or clarity was required. C2T recalled that the use of the “yes” and “no” buttons (to explain wrong answers if needed) were well-used, as were the discussion points.

The PACK model acknowledges that PACK trainers play a critical role in motivating learning. Their presence ensures staff arrive at training sessions due to the fundamental nursing ethos of being accountable to colleagues (trainers are not always senior staff members), and a component of the training design is that they encourage understanding the importance of their new knowledge in the health system and their day-to-day work. Unfortunately, C1T was not available to provide this level of support in her clinic. Despite a preference and belief in this blended learning option, there is real difficulty in ensuring

trainers get to their facilities to provide the support required. The PACK model is that facility-based staff assume the role of PACK Facility trainer, however, as evidenced in these case studies, there is variation in how the model is implemented and off-site Facility Trainers are common.

4.3.4.2. PACK e-learning design for Learning

C1N1 expressed a preference for face-to-face interaction for several reasons (see group learning below). C1N2 seemed very open to blended learning as an option for PACK and other in-service training. She would be willing to do e-learning at home or on weekends, although did highlight that this is unlikely to be the case with nurses generally. The option to load the cases onto individual home laptops or computers was available to the study participants although it seems not explicitly encouraged and did not occur. With blended learning, a disadvantage is the waiting for clarity or support; thus, it is preferable for a manned system to support the e-learning, reinforcing the need for clarity in order to practice safely as a healthcare provider.

Clinic 2 was introduced to the PACK e-learning module and completed it with the intended blended learning approach. The nurses completed the module using a mix of trainer-led interaction, small group e-learning sessions and opportunities to engage individually with the e-learning. They liked this combination of learning opportunities:

> *"I prefer both. We sit with her, she showed us the way, and then did I learn something while I was sitting with her, because it's like some kind of case study or something. Then I am following up. If I was with her only then I think I know the PACK, but when I'm alone doing it and it's like an exercise to me" (C2N2)*

Completing most of the cases on her own, C2N1's initial response to the design of the cases was that there was a large volume of information given at once, and even though given in a familiar PACK style, it was not as incremental or broken down as in face-to-face training. Additionally, for C2N1 the absence of the trainer was disconcerting in that she couldn't ask questions, but that the benefit of the e-learning is that it did highlight and explain errors (wrong answer explanations). She noted the e-learning cases differed in

that they *gave* information about a patient, unlike in a face-to-face session where the trainer mimics a consultation by getting the nurses to *ask* her for that information as if she is the patient, which supports critical thinking and reinforces the approach to using the PACK guide.

> *"It's not a negative thing. It's a very interesting thing, but as I was saying it's a lot of information all at once. When you do it in the group, it will be better because there will still be a discussion" (C2N1)*

Another nurse in Clinic 2, C2N2 found the e-learning module easy to access and complete, instructions for use were clear and cases were acceptable overall:

"You get a diagnosis, you get your treatment, you get to know which page to get it on. You get to know what treatment, and who can prescribe the treatment, and who cannot prescribe the treatment" (C2N2)

She liked the way the patient was presented in the e-learning case, as if the patient was in front of her, and the visuals on the screen helped her to remember features of the guide like the red box for emergencies. She also noted that the multiple-choice questions were tricky to answer and sometimes the answers were difficult to get correct (this was intentional).

Lastly, C2N3 found the e-learning module interesting, and realised the cases were simple enough for her to have begun without an orientation. For her, the amount of information provided on each screen was acceptable, as she had been prepared for some reading as part of the cases. She approved of the visual experience of using the cases and use of the waiting room scene.

"I liked the fact that there were pictures because we could discuss seeing the picture and see okay, that one. Then when we get to the scenario then we could see, that's why …" (C2N3)

For her, the flow of the cases was similar to the experience of the face-to-face training, and this base provided the familiar PACK approach for continuing with the cases on her own:

> *"Everything was alright, because since we had training with C2T before, we know that if you get whatever question then you go, you check what you will need to focus on then you go to the contents page and you look for that, then you go to that particular page, and you read starting from on top going to each box, then treating" (C2N3)*

Clinic 2 nurses had discussions around content they were unsure of, covering issues in the cases as well as the specific discussion points embedded in each case - as they viewed these as compulsory and were accustomed to these discussions with their trainer. The wrong answer explanations provided adequate guidance at times. However, they did require some opportunity to discuss with colleagues, particularly if the content was unfamiliar:

> *"I liked the fact that if I get it wrong, then it will show that I got it wrong, then I go back, I read again, and I get it wrong again, then I see what did I miss … The only problem was whatever we didn't understand we had no one to ask." (C2N3)*

4.3.5 Mobile technology for flexibility

Both clinics noted an interest in using smartphones instead of computers for the e-learning cases, as this would provide more flexibility and access. A useful alternative may be that nurses use their own smart devices (phones or tablets) and be given the opportunity to complete e-learning modules in their own time. C1T noted that encouraging the use of the e-learning option on nurses' own devices, where and whenever they chose, would be a way of improving uptake of the e-learning module. Phone access may fit lifestyle options better as many South Africans use public transport and could have this additional travel time to complete e-learning.

However, C1T did mention concerns for the level of detail PACK training required and the challenges of interfacing on a small screen (indeed one of the initial reasons for not doing so in this module). The nurses in Clinic 2 were confident in the use of the e-learning module once it had been loaded onto the clinic computer but waiting for the computer to be available was a challenge, partially contributing to the interest in using a phone for e-learning instead.

"When I'm bored you can just open your phone and then study for a few minutes. Traveling, you're on your phone. I think it would be better in your phone than on a computer" (C2N2)

Clinic 2 nurses regarded the flexibility of PACK e-learning training as an advantage, as one could leave and then continue a case when running out of time or you run needing to see a patient. Having the training on a phone would add to this advantage. Using a phone for e-learning seems very appealing, particularly if it gives the sense of being a game. There was also willingness to download onto a personal device like a phone. C2N2 noted however that this flexibility does have the disadvantage of requiring a level of personal discipline, sometimes difficult to maintain under the pressures of patient care.

The functionality of a phone is more streamlined and faster to navigate, particularly more so than a book according to C2N3:

"Phone is easier, you just type whatever you want then it pops up, but if I'm using a book then I will have to look for the page number. . ." (C2N3)

However, the culture of phone use in health care is worth noting. C2N3 was concerned that having any PACK information on a phone may cause problems with patients as it is seen as unprofessional for nurses in particular to be looking at their phone during a consultation. Tablets were perceived as a potential option, but there were safety concerns - they would be stolen according to C2N3.

". . . but a patient is sitting there, it's not professional, but for doctors, I think, it's not a problem because they always looking stuff on their phones." (C2N3)

4.3.6 Facilitating learning

4.3.6.1. Group teaching

The importance of group facilitation and the learning principles embedded in the PACK approach come across strongly from C1T. However, application of these appeared minimal due to limited contact with the clinic. C1T regards the traditional PACK face-to-face interaction as the "gold standard", preferable to the assumed approach of learning alone when completing PACK e-learning training. Reasons for this include the pressure on the individual, as well as advocacy for one of the fundamental PACK training learning principles – the opportunity to share and learn from colleagues within the clinic environment.

"Again, I think the self-directed thing puts a lot of pressure on the individual, I think" (C1T)

"Person-to-person training I think, if done properly, maybe should still be the gold standard. You know because There's just more opportunity and there's more atmosphere for discussion. Which always leads to more learning opportunities. The clicking through sort of mechanism, whereas when there's person-to-person, I find we always draw on an experience" (C1T)

In Clinic 2, the trainer's experience in group facilitation appeared to contribute to the e-learning module completion by adapting group structure, environment and pace to the

varied clinical experience, qualifications, language, culture, age and personality of clinic staff. It seems unlikely that this would have occurred without two factors in place: 1) The well-established learning relationship and buy-in into PACK, and 2) The presence of the trainer during some of the e-learning sessions.

A strong PACK training group was already established by C2T in Clinic 2, and the e-learning cases fitted into their training routine well. As an experienced trainer, she was able to adjust her training style and organise learners in a way that ensured they would feel as confident as possible to attempt the e-learning module by pairing digitally literate and confident group members with those that were less so. She was present during the initial training to offer support and encouragement despite strong resistance from some of the group.

This trainer was also able to target responses to questions and explanations to the needs of her group and their varied scope of practice. This made learning relevant to their day-to-day work (even if it didn't initially seem to them that it was), thereby supporting the key situated learning principles embedded within the cases and strengthening working relationships across the clinic. For example, she used competition and games within the session to illustrate the big picture of how the clinic worked, highlighting individual scope of practice and how they as individuals influenced each other's workflow. It is in this way that buy-in to PACK training is established and sustained over time, facilitating module completion.

Interaction and discussion was good, with initial participant reluctance progressing to full participation fairly quickly according to C2T. Six of the seven nurses at the clinic chose to complete the cases in groups or pairs. One nurse who did the cases on her own reported missing the group interaction and interaction with the trainer. She was able to encourage the use of the e-learning cases at the clinic in her absence: by organising them into working pairs or groups and allocated a go-to person to assist with the computer and cascade the introduction if needed.

4.3.7 Group learning

Learning in groups appears to provide numerous advantages to learners in this context, including accountability for attendance, interaction, and reassurance, varied clinical content exposure and speedy completion of the cases.

When C1N1 was asked about completing the cases, her initial responses seemed very agitated. She was only available for a telephonic interview and quickly said there was just no time for the e-learning module. She also seemed to miss the group interaction and someone to ask questions:

> *"It is still loaded on the computer, but now none of us had really the time to go and sit and do a case, … personally I like interaction and ask, 'look here, am I on the right track?' " (C1N1)*

For this nurse PACK face-to-face training was enjoyable, particularly the interaction and the opportunity to discuss different versions of a case – particularly important in a context where each patient presents in a distinct way and personal experiences may differ. It seems that the interaction, discussion, and reflection in the original style of PACK training may have been so deeply embedded that this nurse could not cope with a shift in approach.

The potential lack of monitoring of whether she was on the right track and doing the cases correctly concerned C1N1. This need was catered for within the cases in the form of wrong answer explanations, however as she did not attempt them was unable to comment on whether this was adequate or not. It is noteworthy that this was emphasised as a major concern for her, and potentially a reason for not attempting the cases in the first place.

> ***"****The ideal of the situation is if you have the e-learning, it's fine, but then there must be time, there must be enough staff to do that, and it's still that you must do it on your own pace, but there must also be somehow a system that say, ok she did tell us that, and she did show us that if you go this side, it will flick back*

and say, but it's actually the wrong side that you are doing, but it still doesn't give me why is it the wrong side if I click on this" (C1N1)

Similarly, for C1N2 the disadvantage of e-learning is the absence of immediate support and clarity for content queries – with the potentially critical effect of incorrect patient management as a result.

"I mean you need clarity, because then if you're going do it, you need to understand what you're doing, and what it's for. So then if you have a client in front of you, and you still don't understand what the case was about, and you have same presenting case then you still do the wrong thing, because you don't understand what you're supposed to do." (C1N2)

Clinic 2 nurses continued with the module and completed it. They did express that it was sometimes easier if a trainer was coming to do it with them, and that time for computer learning should be similarly allocated in order to avoid it being deprioritised, but this did not stop them from completing the module. All three nurses interviewed in Clinic 2 were uncomfortable with being unable to ask questions directly to a trainer whilst completing the e-learning cases - despite the wrong answer explanations being understood and valued they still wanted to be able to ask a trainer about their query. They relied heavily on their colleagues and were reassured by the opportunity to have discussions:

". . . That's why I say in a case like this, you want this kind of discussion with someone because you are scared of treating the wrong thing and perhaps you should've treated the other one" (C2N1)

Content with the blended learning approach of some trainer-led and some e-learning cases, C2N2 however noted that without the pressure of colleagues and structured time set aside, it was difficult to be responsible enough to complete the e-learning in her own time (she partnered with another nurse to complete the cases). In this case being responsible to the clinic group to attend training would be a potential enabler of PACK training completion.

Similarly, the clinic group may be a requirement for speedy completion of the training, and the bringing together of different experiences in nursing is useful in bringing life to PACK training and encouraging learning from one another's experiences:

"If I was doing them on my own maybe I would have got lazy and stopped. So, I like discussing" (C2N3)

". . . because different people have different ideas and there are people that ask questions that you didn't even think of, but they also help you because now that they talked about it then you also get to know" (C2N3)

4.3.8 Solitary learning

In both clinics there was a clear expectation that nurses would continue with the module in the absence of the trainer, *however* in Clinic 1, without contact C1T this did not occur:

"If they find some free time that they would be able to access and get done on their own, which is kind of what the e-learning model is about as far as I understand, but the only feedback that I've gotten is that they just can't justify the time to access and then do it" (C1T)

At the time of the interview the trainer had not yet visited Clinic 1 for a PACK training session for at least 6 months, and the nurses had not engaged with the e-learning module at all during this time. C1T thought that offering the e-learning cases on a device other than a computer would encourage nurses to do the module on their own. Both C1T and C2T had concerns about nurses finding the time or agency to discuss health systems issues emerging from the PACK e-learning module (the discussion points in the cases) with their managers or other colleagues – something usually facilitated by the trainer and possibly more challenging to do without one present or as part of the e-learning module.

"Again, I think the self-directed thing puts a lot of pressure on the individual, I think. Whereas the one-on-one, or rather having a personal PACK trainer

person. You have the ability to at least bring the case to a little bit more light and break it down and sort of the thing . . .” (C1T)

C1N1 seemed to be comfortable with the e-learning modules design, saying this was ‘fine’, but that there was no one to assist during a solitary learning experience was foreign, uncomfortable and quite unsafe for this nurse. While C1N2 claimed she was willing to take the cases home herself (although despite having a laptop she had not done this), she felt that other nurses wouldn’t necessarily do the same.

In clinic two, only one nurse (C2N1) elected to complete the e-learning cases on her own, this was mostly due to workload issues as she struggled to get away when the other nurses could. C2T also referred to her as a loner, who preferred one-on-one interaction with her as a trainer, as this stimulated her slightly more advanced clinical skills as a Clinical Nurse Practitioner (CNP). Despite C2N1 completing the cases on her own, she was aware of it being a lot of information to process and that being in a group may have been preferable. For her a key learning need is being sure if you are correct or not, and if not, why:

“… but that's why I say in a case like this, you want this kind of discussion with someone because you are scared of treating the wrong thing and perhaps you should've treated the other one” (C2N1)

4.3.9 Barriers to teaching and learning

4.3.9.1. Clinical content

Lack of familiarity with the module topic has been noted as a barrier to uptake of PACK face-to-face training for many years – participants can be initially uncomfortable with new information or being asked to engage with content without a thorough background and opportunities to reflect appropriately. The clinical content chosen for the PACK e-learning module provided an unanticipated challenge to its uptake. Mental Health is an area of focus globally and locally but is not yet widely accepted as the responsibility of every nurse to attend to in every patient, as it is often perceived as an area for specialised clinicians.

This, in combination with the newness of exploring e-learning, was noted by both trainers as possibly too much of a challenge for the first module of the PACK e-learning cases:

"I do find that even the subject of mental health, I would've had some difficulty even on the paper-based training to get them into that module, because of the subject matter" (C1T)

However, C2T actively encouraged learning about mental health, giving practical examples of where the content applied to each nurse in the group, including communication skills. The value of providing coaching and external motivation is important to note even with the e-learning module.

If a clinical topic is not in an individual's area of expertise or interest it may be less appealing. C1N1 displayed a degree of excitement at the prospect of PACK Child being available for training purposes, highlighting the need for the modules presented to be perceived as relevant. Immediate relevance is clearly important and 'extra' is too much, even though this clinic's responsibility is to provide care across the full life-course:

"I think then it becomes not so much a priority for us because now we focus mostly on babies here. We're the baby clinic" (C1N1)

4.3.10 Accountability and motivation

At times, a more punitive clinical audit approach may be required, highlighting errors and gaps in patient care and holding nurses accountable for their management of patients. But this alone will not ensure nurses complete the PACK training; they still need encouragement.

"... and if you didn't screen them for diabetes, hypertension . . . I can hold you accountable, because I taught you in all of those modules. So, don't tell me you didn't know. What does it tell me? You didn't use your guide" (C2T)

A reward or acknowledgement for completion of PACK training would be useful according to C2T, perhaps in the form of authorisation or competency – which does not exist for PACK in the Western Cape, although has been implemented elsewhere in South Africa to some extent. C2T is also motivated to encourage e-learning for nurses to have the opportunity to grow and study further, seeing the potential in both older and junior nurses and encouraging them.

"You know the nice thing about e-learning is, if you can grow this e-learning, we going to entice people to go and study further, even the older generation . . .because they're going to be used to using it" (C2T)

4.3.11 Time to teach

Time and workload challenges are centred around a combination of factors that include running a clinic service with minimal or too few staff, as a result having no time to do even the required administration, let alone completion of the e-learning module. Clinics don't necessarily 'have time' for training, this is something that must be mandated, enforced or demanded in some way:

"I think me coming there seems to be more of a hard and fast appointment that people can't necessarily excuse so easily, but when they've got free time, there's always a lot of other stuff to get done as well. So to put admin that is overdue aside, to do the e-learning, it doesn't seem rational to them, and there is always that intimidation of the computer" (C1T)

Clinic 2 has protected time allocated to meetings and in-service training every Thursday afternoon – patients know they will not be seen unless there is an emergency after 11 am. In a larger clinic, like Clinic 2, even if there were nurses who were away from the clinic for various reasons or seeing patients, C2T could be confident that she would be able to find at least a couple of nurses to train on any given Thursday.

The time challenge also applies to the availability of trainers to travel to sometimes distant clinics (in cases where they are not permanently posted at the clinic). The e-learning module was intended to support this gap and allow nurses to complete cases in their own time without reliance on face-to-face sessions. Indeed, for smaller clinics it was assumed that this would be an advantage, particularly for a trainer who would no longer need to travel to visit a tiny clinic with only one or perhaps two nurses for a training session. It seems that the e-learning module was unable to address this gap – mainly because in smaller clinics it is less likely that there is enough staff to cover each other for an hour or two of e-learning instead of attending to patients' needs.

4.3.12 Time to learn

Despite the motivation and expression of interest in completing the e-learning module, the lack of protected, covered time to do so is a deterrent. C1N1 maintained that e-learning was 'fine' if there was enough time and staff to ensure space on the daily to-do list for learning. Additionally, in the case of the blended approach followed in Clinic 1 for the initial introduction, completion of the module was hampered by the lack of time for support visits and follow-up sessions by the trainer, especially because when the trainer visits the nurses are more easily able to prioritise their time.

> *"With us I think it's a tough problem because then we don't have cut-off times where you say, okay we can't see clients anymore. So, we cannot take time away on the computer unless you do it in your lunch time. So, it's a staff problem that we have and we actually only have two computers" (C1N2)*

There is a contradiction in claiming to want or be willing to do in-service training (even asking for the structure to be similar to what is offered in PACK) and then not doing it:

> *We must see to the clients and then we don't have time for ourselves to get the knowledge or refresh on what we got in school. So it would be nice if we can get some in-service training every now and then; maybe every second week, that would be very nice" (C1N2)*

One of the intended advantages of providing PACK e-learning cases was to increase flexibility in terms of when learning occurred and decrease interruptions to clinic services. In Clinic 1 however, the flexibility seemed to reduce their agency to prioritise the training. The drive to set other duties aside to sit at a computer and complete e-learning cases did not exist for C1N1, or at least was not strong enough to override the other requirements of the job. For the e-learning module to be completed, it would have required prioritisation and in this clinic the motivation to complete the module seemed inadequate, as well as not actively supported as intended by the trainer.

Clinic 2 nurses were encouraged to complete cases whenever they could, but also aware that progress was expected and that there were colleagues to support them. To complete the Mental Health module, they had to meet to do the cases "two or three times". It was still difficult to complete the training in time not allocated to training – these 'spare' or 'quiet' moments don't generally exist according to nurses, and they prioritise patient care over everything else:

"Client is the most important thing, when I see client in front of me, or patient, computers will be the last thing…" (C1N2)

Notably difficult for C2N3 was that sometimes when she did have time during work hours the computers were not free, however she said she would be keen to do the e-learning module on her phone in her personal free time – for example while at home watching TV, or traveling long distances. C2N2 would have taken them home to complete on her laptop but hadn't considered it an option at the time. She found the e-learning module easy to do and was only slowed down by work commitments, not lack of interest or difficulty. These work commitments made it more difficult to attend to e-learning than to attend the face-to-face sessions due to the pressure to commit to a trainer who had arrived for a session.

Doing the cases together was easier for C2N3 and this may have been a motivation to complete them, and when they didn't finish a case, they would find time to get together again:

“It didn’t take that long since we were two and if I'm not sure about something then we discussed it, and we go through book together. So I think it was easier, because we were discussing it” (C2N3)

It is important to note that time and staff challenges in combination with motivation and clinical content, created a situation for these nurses that prevented them from engaging with the training as intended – and that this interplay of factors is likely to repeat itself at other similar clinics.

4.4 Conclusion

The findings chapter explored the overarching intention for e-learning in the Western Cape DOH with regards to PACK, and the factors influencing the PACK e-learning implementation in two clinics. Emerging themes included access to technology and internet, digital literacy, smartphone access and preferences, experiences of facilitation and learning in groups and alone as well as issues around time, motivation, and clinical content.

4.5 Discussion

PACK is an established in-service health system strengthening intervention, with a situated learning approach that covers large amounts of complex content and includes a monitoring and evaluation (M&E) component. It was a challenge to fit PACK neatly into the modes of e-learning delivery available at the time, as they lacked interactivity offline and tended to be content or text-heavy which did not align with the PACK training approach. The initial PACK e-learning endeavour aimed to explore the options available and establish an e-learning approach that better articulated with the principles of PACK, which could feasibly form the underpinning of a fully online approach once infrastructure and access challenges allowed. The e-learning option also aimed to fulfil the blended learning and M&E needs of the PACK programme, by providing continued access to the PACK trainer, allowing for flexibility in the learning experience and also monitoring of training progress and completion. The section below explores the findings of the study in terms of this overarching intent to answer the question "*What are primary health care clinic trainers' and nurses' learning experiences of using educational technology as part of an established in-service training programme"* and the literature and theoretical frameworks described in Chapter 2.

4.5.1 Access, digital literacy and introduction of e-learning

Variable access to technology, as noted by others (Feldacker *et al.*, 2017; Watkins *et al.*, 2018; Barteit *et al*., 2019), is a concern for access to e-learning and, in combination with variable digital literacy, emphasises the need to provide different types of learning opportunities in the context of PHC. In the case of e-learning these options should be well supported (Mars, 2012) and facilitated in the early stages of uptake.

In this study, e-learning experience may have determined willingness to engage and the combination of level of education, age and how recently education was completed appears to have an overall influence on willingness, a finding supported by others (Watkins *et al.*, 2018). Karaman (2011) echoes these findings, particularly in relation to non-hospital settings and daily exposure to computer use. The impact of a facilitated introduction of the e-learning module and supported training sessions, both initially and in

an ongoing way, is an important finding that may well be a key factor determining success of interventions like this.

The DOH stakeholders were aware of many of the challenges described by the trainers and nurses, including computer and internet access issues, and expressed an understanding that changes in the traditional learning approach will need to happen over time. It is encouraging to see that even though e-learning is seen as the way forward by DOH, a flexible approach is acknowledged and accommodated as for some in the health services, face-to-face training may remain the ‘gold standard' for a while. The DOH training department e-learning vision is a long-term one that will take time to fully action, and there is reportedly high-level management support for these changes, various funding streams for online learning being included in budgets more often, and inclusion in overall strategic planning. In the absence of operational requirements for all elements being available, the DOH training department remains motivated to ensure that the educational frameworks for online learning options are available, that service providers are designing their offerings to ensure they can be made available online should the opportunity exist and continue in their efforts to get the systems up and running that can support in-service e-learning in health services.

4.5.2 e-Learning design and devices

In terms of the design of the module overall, it appears that the considerable effort invested into creation of the e-learning cases from an educational perspective achieved its intended outcome, in that participants had minimal critique on the cases themselves and found the approach familiar, engaging and similar to the PACK face-to-face cases. The design and use of a PDF for a computer was a concern because participants indicated a need to be able to complete the module on their phones, raising the challenges of too much detail for a small screen as well as the space and data constraints of individual phone use. This is a finding supported by data from elsewhere in South Africa (Watkins *et al.*, 2018; Fischer *et al.*, 2019).

4.5.3 Barriers and enablers

Trainer selection and availability as a resource to support blended learning is a critical factor for consideration in this context. It was difficult for the trainer to get to Clinic 1 to provide support and appeared to be the main contributor to lack of completion, suggesting that e-learning requires some facilitation.

Historically, small clinics used to service mainly family planning and child health needs, but this scope has grown significantly over recent years and PHC facilities are required to see a much more complex range of patients, requiring increasingly advanced nursing knowledge and skill. PACK supports the provision of integrated care, and completion of the training is a requirement in the country's Ideal Clinic initiative: nurses are required to be PACK trained. Integrated care provision is a shift from the siloed or specialized approach of previous years, and this requires nurses to adapt, update and be flexible in their approach to their day-to-day work. It is within this context that the difficulty of engaging with the mental health module emerged as it did not resonate sufficiently to embed contextually, and understandably a different module choice may have had better uptake.

The interplay of factors of time and motivation to learn, in combination with clinical content topics, is an issue for nurses in this study, and elsewhere. In a study in rural SA, nurses also claimed there is not enough time to use computers, even suggesting their own apathy as a contributor (Watkins *et al.*, 2018). In their CPD study in SSA, Feldacker *et al.* (2017) highlight similar issues - particularly a lack of motivation. Of interest was that while DOH stakeholders acknowledged that time was a challenge in completing in-service training in PHC, they still suggested that with enough motivation or *"drive and discipline"* they would be able to overcome challenges.

4.5.4 Situated learning in a community of practice

In this study, we aimed to examine how the situated learning in a community of practice approach may have been appropriated in PACK e-learning training. Wenger and Trayner-Wenger (2015) explore the *domain, community,* and *practice* as characteristics of a COP. The *domain* is a specific area of interest, requiring commitment and competence. Here the domain is nursing, specifically within PHC. New additions to this domain were both the PACK mental health module and the e-learning approach. The content of the mental health module may have resulted in a learning opportunity that was not 'situated' enough in the domain, did not embed contextually, and appears to have contributed to poor uptake - Clinic 1 did not move from legitimate peripheral participation to full participation as in the case of Clinic 2.

In the *community* component of the COP, active guidance and assistance and sharing is important i.e. by participation in and completion of PACK training and use of the e-learning module. There was a clear preference for a blended approach in the PACK training, combining e-learning learning with facilitator-led or group case discussions. The e-learning cases were acceptable overall, but confidence and completion was dependent on well-facilitated introduction by a skilled and dedicated trainer, regular follow-up by a trainer, and learning encounters and discussions taking place in pairs or groups, as was illustrated by the differences in clinic experiences. Initially the assumption was that this would happen individually, but it turned out that the e-learning cases became the 'voice' of the trainer and that nurses gathered to complete the module, learning in a community (Li *et al.*, 2009).

Wenger (2000) explained joint enterprise as the community's shared sense of values. In this study *joint enterprise* impacted the sense of collective accountability, this came through strongly in the positive and negative in both clinics in how they describe working together (or not) and how they manage their time related to training. In Clinic 1 the e-learning module was offered, made relatively easily available, and thoroughly explained - it could be argued it was offered in a format that should have resulted in completion. However, in the absence of the COP and related accountability to the trainer and each

other, it appeared impossible to take on. In Clinic 2 it appeared that the time issues were balanced by a responsibility towards the group, suggesting that the COP may be a pathway to overcoming these challenges.

Ongoing *leadership* and *connectivity* in the form of the trainer, and within the intentional structured small learning pairings and groups, provided the momentum for the COP to continue learning in her absence in Clinic 2, and may be the reason Clinic 1 did not continue.

Mutuality speaks to trust and the ability to access help during the learning experience, as a member of the COP. This is important for learning designers in this context, and particularly for nurses. This may have been partially due to the familiarity of the face-to-face model, but an emphasis on medico-legal responsibility and stress of not confirming you are on the right track was a significant component of this and should be well supported. Being on the right track, knowing you are learning or understanding correctly is a critical component of the nursing learning experience - patients' lives are at stake - and so the inherent risk in this learning environment and the effect of a nurse being uncertain about clinical management cannot be underestimated. In Clinic 1 the nurses couldn't see a way of doing the e-learning without access to this support. In Clinic 2, despite some discomfort that the trainer was not always there, learning continued and was completed within the pairs or small groups and discussion was a critical feature of this.

Shared repertoire refers to how the communal resources are used to be found competent (Wenger, 2000). PACK generated the content of the *shared repertoire* and C2T was able to bring into focus the value of this shared repertoire on them as individuals, for patients, and as a clinic system. Regular contact with the trainer in Clinic 2 allowed her to put into effect the health systems strengthening component of the PACK model - to highlight the differences in scope and how each page in PACK affects clinic function, patient flow to ensure people step outside of their siloed thinking and then to begin to effect gradual change with each other's support. This appears to have been a critical component in

uptake of the e-learning offering. In Clinic 1, shared repertoire appeared absent in the instance of PACK training.

The *practice* is a long-term undertaking developing skills and tools over time (Wenger and Trayner-Wenger, 2015) i.e. using and applying the PACK guide resulting in health systems strengthening at individual and clinic level. This looks at the more long-term undertaking of these skills, including being adept at e-learning. This study did not assess the efficacy of learning on clinical practice, but the use of e-learning and adaptation to it as part of learning practice was clearly very different in the two clinics.

The instruction to complete e-learning did not generate the motivation these nurses needed to learn in Clinic 1, but the instruction together with the COP in Clinic 2 did. Linked to this, the DOH stakeholders noted the importance of synchronous activities during e-learning for those who required assistance or had questions. This space for discussions provided for the situated learning methodology (Herrington and Oliver, 1991), and concretised understanding based on shared day-to-day experience and knowledge - thus developing the domain, the community and the practice required in a community of practice (Wenger, 2000).

It is important that C1T repeatedly referred to face-to-face training as the “gold standard”, and it seems there is work to be done in firstly developing a new gold standard in e-learning for health professionals, and then supporting the transition from face-to-face to blended or online options in a way that empowers them to believe that the standard is high enough. By using the e-learning cases as a template or platform for interaction, PACK training may increasingly become embedded as part of the culture and required competence of being a full member of the clinic staff community. Continued application of situated learning in COP concepts to the e-learning design (Table 2.1 and Figure 2.4) and attempting to encourage the creation of spaces in which competence can develop within the clinic seems a worthwhile strategy.

4.5.5 Conclusion

Nurses in this study had variable access to computers and the internet, but all used their smartphones, including the internet and various applications, on a daily basis. Digital literacy does affect engagement with e-learning, as does previous exposure to e-learning to some extent. Barriers to learning are complex and emerged as a combination of access, time, clinical content, and motivation issues. The situated learning in a community of practice approach was applied in one clinic and this appeared to have supported a successful learning experience and is an enabler of e-learning in this case. Facilitator skill influenced this success. Partial application of the approach in the other clinic, without ongoing support, was unsuccessful. Mobile friendly e-learning opportunities are seen as a potential enabler for future versions.

Situated learning principles and community of practice theory provided the underpinnings for a blended PACK e-learning intervention that was well-received but experienced various challenges during initial implementation. Recommendations for future work in this area follow in the next chapter.

5. Summary and recommendations

This thesis set out to describe and understand the use of the PACK e-learning mental health module, particularly to refine the initial design and examining factors influencing its use prior to further roll out. The insights from DOH stakeholders, and experiences reflected here from nurses and trainers in two clinics, showed an overall acceptability of the design aspects of the module but noted the complexities of access to technology, digital literacy, access to experienced facilitators and varied learning preferences.

There is variable access to technology, digital literacy and previous experience with e-learning amongst primary healthcare nurses and these factors influenced engagement with the e-learning cases to some extent. However, despite this variation, which was consistent across both participating clinics, in situations where facilitated learning was supported and group interaction encouraged, the e-learning case engagement was more successful. Situated learning within a community of practice appeared to create an environment which provided a space for discussion and increasing confidence in understanding and achievement of learning outcomes.

5.1 Recommendations for e-learning designers:

In terms of design principles going forward, the cases themselves appear to be well-structured and this educational approach could aim to be applied in future iterations or with different technologies without much further refinement except for technology related differences. It seems that the cascade model is still necessary, at least initially, and continued PACK trainer resource allocation for a blended PACK training model is advised as e-learning alone is challenging in this kind of complex clinical content. But it can be modified to include a combination of trainer-led interaction (either face-to-face or supported by mobile applications like WhatsApp groups), small group e-learning sessions and opportunities to engage individually with the e-learning.

Future online models should consider including a Learning Management System (LMS) course with built-in discussion forums, evaluation, monitoring and certification, paired with a face-to-face mentorship component to support clinical skills and discussions where necessary is a recommendation - all available on phones as well as other devices. If future PACK e-learning solutions can provide formal evaluation embedded within the module, this must be assessed for its ability to translate into increased confidence and changed practice and compared to the traditional PACK training approach (Feng *et al.*, 2013; De Leeuw *et al.*, 2016; Nishimwe *et al.*, 2021). Additionally, the complex interplay of factors like time to teach and learn, clinical content, motivation and accountability to the trainer and group should be considered in e-learning design.

5.2 Recommendations for the Department of Health

As supported by the DOH interviews, structured and sustained infrastructure, device, connectivity and ICT support funding, outside of partner or research pilot implementations, is required in order to develop long-term e-learning solutions in the PHC context in South Africa and elsewhere (Barteit *et al.*, 2019; Fischer *et al.*, 2019; Ngenzi *et al.* 2021).

For e-learning in this context, a smartphone-friendly interface is key to accessibility and flexibility, preferably on a zero-rated online platform that does not charge the user (Watkins *et al.*, 2018; Fischer *et al.*, 2019; Nishimwe *et al.*, 2021). Intranet or internet availability at health facilities for staff may go a long way in improving access to e-learning. This, in combination with improved community awareness and posters may work towards an environment that normalises and encourages nurses using their phones for learning. Additionally, protected time for in-service learning within the work week may improve training targets.

5.3 Recommendations for implementers and trainers:

Facilitated introduction to e-learning with ongoing, structured support during the transition from a face-to-face learning approach to an e-learning approach are necessary. Interim

measures like formal WhatsApp groups would help to serve this need as the wait for improved online access and technology options materialise. The risk of medico-legal hazard is deeply ingrained in every nurse from early on and is a determinant of how nurses' practice. Offering a learning experience, covering such complex clinical content and patient management, that does not provide the reassurance of confirmation and evaluation of learning (without a Trainer on hand to do so) is a concern and a barrier that must be overcome for future versions.

Beyond South Africa, PACK is in various stages of roll out in Botswana, Brazil, Ethiopia, and Nigeria. In Ethiopia, for example, a large-scale implementation is underway in hundreds of clinics where PACK was identified as a key PHC strategy. There is demand for PACK from other countries, like Indonesia and Vietnam. Thus, it is important that the PACK training approach continues to grow and adapt in order to provide for the needs of its end-users and ensure PHC staff continue to be trained and updated using the mandated clinical policies for patient care. These recommendations provide additional data for local and global LMIC contexts in how to improve design and implementation of e-learning interventions in PHC.

5.4 Limitations of the study

As described in Chapter 2, this study took place in a context which posed multiple challenges in evaluating the topic under study, particularly as the roll out of the intervention was managed by the DOH and not the KTU. It was difficult to find active and willing clinics to participate in the research and so the sample group was small, and the permission processes involved were lengthy. This resulted in limited access to information and participants, and numerous time delays in gathering data – and may have yielded less in-depth reporting of the 'human experience' in the cases than is ideal. In combination with the candidate's capacity challenges, the work of writing up this study occurred over an extended period. As the candidate conducted interviews herself and was known to some of the participants there is caution around how this may have impacted responses, but the interview data does seem frank and clear in its suggestions, as participants were aware

their feedback would inform future developments of PACK. The candidate aimed to be as objective as possible throughout the study, but the role and lens of the developer-researcher is noted. This study did not evaluate the outcome of the PACK e-learning module on clinical practice, which is a gap in this and other studies in health sciences e-learning interventions (Feng *et al.*, 2013; De Leeuw *et al.*, 2016; Nishimwe *et al.*, 2021).

5.5 Recommendations for further study

Online and e-learning experiences and learner needs should be explored further in this context to contribute to the body of evidence in this area. A larger implementation study, that includes PACK implementations in other countries, including outcome evaluation in a broader range of participants, would help to establish training design guidelines for the PACK programme and others in PHC in-service training. Additionally, a more in-depth analysis of the educational principles and instructional design elements found to be enhancing learning in PACK e-learning would be beneficial.

5.6 Conclusion

The PACK e-learning training design was found to be acceptable and fulfilled its intended learning goals in one clinic, with trainer support, but failed in another clinic without the same level of support - despite similar challenges experienced in both clinics. A structured and well-facilitated learning relationship with a trainer, and within the clinic community of practice, was required for successful implementation of PACK e-learning. In the context of coronavirus pandemic, rapid adjustments to learning online have been required in all sectors, especially health. With this sustained focus on online learning models, this study provides valuable insight to the nurse experience of e-learning and its associated barriers and enablers, particularly for decision makers in Departments of Health and in-service learning design.

6. References

1. van den Akker, J. Bannan, B., Kelly, A., Nieveen, N., Plomp, T. (2007). *An Introduction to Educational Design Research*. Available at: http://www.slo.nl/downloads/2009/Introduction_20to_20education_20design_20research.pdf.

2. Amiel, T., & Reeves, T. C. (2008) 'Design-Based Research and Educational Technology : Rethinking Technology and the Research Agenda', *Educational Technology & Society*, 11, pp. 29–40. Available at: http://www.ifets.info/journals/11_4/3.pdf.

3. Anand, P., Thukral, A., Deorari, AK., National Neonatology Forum Network. Dissemination of Best Practices in Preterm Care Through a Novel Mobile Phone-Based Interactive e-Learning Platform. *The Indian Journal of Pediatrics* (November 2021) 88(11):1068–1074 https://doi.org/10.1007/s12098-021-03689-6

4. Barteit, S., Guzek, D., Jahn, A., Bärnighausen, T., Jorge, M. M., & Neuhann, F. (2019) 'Evaluation of e-learning for medical education in low- and middle-income countries : A systematic review', *Computers & Education*, 145(October 2020). doi: 10.1016/j.compedu.2019.103726.

5. Bashingwa, J.J.H.,Shah, N., Mohan, D., Scott, K., Chamberlain, S., Mulder, N., Rahul, S., Arora, S., Chakraborty, A., Ummer, O., Ved, R., LeFevre, A.E., Kilkari Impact Evaluation team. Examining the reach and exposure of a mobile phone-based training programme for frontline health workers (ASHAs) in 13 states across India. *BMJ Global Health* 2021 ;6:e005299. doi:10.1136/ bmjgh-2021-005299

6. Baxter, P. and Jack, S. (2008) Qualitative Case Study Methodology: Study Design and Implementation for Novice Researchers, The Qualitative Report. Available at: http://www.nova.edu/ssss/QR/QR13-4/baxter.pdf.

7. Berndt, A., Murray, CM., Kennedy, K., Stanley, MJ., Gilbert-Hunt, S. (2017) 'Effectiveness of distance learning strategies for continuing professional development (CPD) for rural allied health practitioners: A systematic review', *BMC Medical Education*. BMC Medical Education, 17(1), pp. 1–13. doi: 10.1186/s12909-017-0949-5.

8. Bertman, V., Petracca, F., Makunike-Chickwinya, B., Jonga, A., Dupwa,B., Jenami N., Nartker, A., Wall, L., Reason, L., Kundhlande, P., and Downer, A. 2019. Health worker text messaging for blended learning, peer support, and mentoring in pediatric and adolescent HIV/AIDS care: a case study in Zimbabwe. *Human Resources for Health*. https://doi.org/10.1186/s12960-019-0364-6

9. Bluestone, J., Johnson, P., Fullerton, J., Carr, C., Alderman, J., BonTempo, J. (2013) *Human Resources for Health*. 11:51. 'Effective in-service training design and delivery : evidence from an integrative literature review'. http://www.human-resources-health.com/content/11/1/51.

10. Brink, H. (2002) Fundamentals of Research Methodology for Health Care Professionals. Fifth edit. Cape Town: Juta & Co, Ltd.

11. Burns, N. and Grove, S. K. (2009) *The Practice of Nursing Research: Appraisal, synthesis and generation of evidence*. Sixth Edit. Edited by Lee Henderson and Rae Robertson. Missouri: Saunders Elsevier.

12. Cronje, J. C. (2005) *The ABC (Aim , Belief , Concern) instant research question generator*. Available at: http://www.learndev.org/dl/BtSM2011/Cronj-The_ABC_Instant_research_question_generator.pdf.

13. Fairall, L., Bateman, E., Cornick, R., Faris, G., Timmerman, V., Folb, N., Bachman, M., Zwarenstein, M. and Smith, R. (2015) 'Innovating to improve primary care in less developed countries: towards a global model.', *BMJ innovations*, 1(4), pp. 196–203. doi: 10.1136/bmjinnov-2015-000045.

14. Feldacker, C., Jacob, S., Chung, MH., Nartker, A. and Kim, HN. (2017) 'Experiences and perceptions of online continuing professional development among clinicians in sub-Saharan Africa', *Human Resources for Health*, 15(1). doi: 10.1186/s12960-017-0266-4.

15. Feng, J.-Y., Chang, Y-T., Chang, H-Y.,Erdley, W., Lin, C-H. and Chang Y-J. (2013) 'Systematic review of effectiveness of situated e-learning on medical and nursing education.', *Worldviews on evidence-based nursing*, 10(3), pp. 174–183. doi: 10.1111/wvn.12005.

16. Fischer, A.E., Sebedi, J., Barron, P., and Lalla-Edward, ST (2019) 'The MomConnect Nurses and Midwives Support Platform (NurseConnect): A Qualitative Process Evaluation Corresponding Author ':, 7, pp. 1–11. doi: 10.2196/11644.

17. Herrington, J. and Oliver, R. (1991) 'Critical Characteristics of Situated Learning : Implications for the Instructional Design of Multimedia', *Learning with technology*, withtechno, pp. 253–262. Available at: http://www.konstruktivismus.uni-koeln.de/didaktik/situierteslernen/herrington.pdf.

18. Karaman, S. (2011) 'Nurses' perceptions of online continuing education.', *BMC medical education*, 11(1), p. 86. doi: 10.1186/1472-6920-11-86.

19. Lave, J. (1991) ‘Chapter 4 Situating Learning in Communities of Practice’, *Perspectives on socially shared cognition*, 2, pp. 63–82. doi: 10.1037/10096-003.

20. De Leeuw, R. A. Westerman, M., Nelson, E., Ket, JCF., and Scheele, F. (2016) ‘Quality specifications in postgraduate medical e-learning: An integrative literature review leading to a postgraduate medical e-learning model’, *BMC Medical Education*. BMC Medical Education, 16(1), pp. 1–10. doi: 10.1186/s12909-016-0700-7.

21. Li, L.C., Grimshaw, J.M., Nielsen, C., Judd, M., Coyte, P.C. and Graham, I.D. (2009) ‘Evolution of Wenger’s concept of community of practice’, *Implementation Science*, 4(1), pp. 1–8. doi: 10.1186/1748-5908-4-11.

22. Maboe, K.A., de Villiers, L. (2011) ‘Computer Assisted Instruction in Nursing Education’, *Africa Journal of Nursing and Midwifery*, (January 2011).

23. Manzini F, Diehl EE, Farias MR, dos Santos RI, Soares L, Rech N, Lorenzoni AA and Leite SN (2020). Analysis of a Blended, In-Service, Continuing Education Course in a Public Health System: Lessons for Education Providers and Healthcare Managers. Front. *Public Health* 8:561238.doi: 10.3389/fpubh.2020.561238

24. Mars, M. (2012) ‘Building the Capacity to Build Capacity in e-Health in Sub-Saharan Africa: The KwaZulu-Natal Experience’, *Telemedicine and e-Health*, 18(1), pp. 32–37. doi: 10.1089/tmj.2011.0146.

25. Mash, B., Fairall, L., Adejayan, O., Ikpefan, O., Kumari, J., Matheel, S., Okun, R. and Yogolelo, W. (2012) 'A morbidity survey of South African primary care', *PLoS ONE*, 7(3). doi: 10.1371/journal.pone.0032358.

26. Masters, K., Ellaway, RH., Topps, D., Archibald, D. and Hogue, R.J. (2016) 'Mobile technologies in medical education: AMEE Guide No. 105', *Medical Teacher*, 38(6), pp. 537–549. doi: 10.3109/0142159X.2016.1141190.

27. Maxwell, J. A. (2009) 'Designing a Qualitative Study', in *The Sage handbook of applied social research methods. London:Sage*. Sage: London, pp. 214–253. Available at: http://www.corwin.com/upm-data/23772_Ch7.pdf.

28. Maxwell, J. A. (2012) A Realist Approach for Qualitative Research. London: Sage.

29. Moore, J. L., Dickson-Deane, C. and Galyen, K. (2011) 'Internet and Higher Education e-Learning , online learning , and distance learning environments : Are they the same ?', *The Internet and Higher Education*. Elsevier Inc., 14(2), pp. 129–135. doi: 10.1016/j.iheduc.2010.10.001.

30. Green, J. and Thorogood, N. (2009) *Qualitative methods for health research.* 2nd edition. Los Angeles: Sage.

31. Naidoo, U., Sandy, P.T. and Roos, J. (2020) 'Determinants of Nursing Campuses ' Readiness to Use a Computerised Training Tool', *Africa Journal of Nursing and Midwifery*, 22(2), pp. 1–18. doi: https://doi.org/10.25159/2520-5293/7001.

32. National Department of Health, S. A. (2018) *Ideal Clinic Manual Version 18 1 April 2018*. Available at: https://www.idealhealthfacility.org.za/.

33. Ngenzi, JL., Scott, RE. and Mars, M., Information and communication technology to enhance continuing professional development (CPD) and continuing medical education (CME) for Rwanda: a scoping review of reviews. *Medical Education* (2021) 21:245 https://doi.org/10.1186/s12909-021-02607-w

34. Nishimwe, A., Ibisomi, L., Nyssen, M. and Conco, D.N.(2021) 'The effect of an mLearning application on nurses ' and midwives ' knowledge and skills for the management of postpartum hemorrhage and neonatal resuscitation : pre – post intervention study', *Human Resources for Health*. BioMed Central, pp. 1–10. doi: 10.1186/s12960-021-00559-2.

35. Omaswa, F., Kiguli-Malwadde, E., Donkor, P. *et al.* (2018) 'The medical education partnership initiative (MEPI): Innovations and lessons for health professions training and research in Africa', *Annals of Global Health*, 84(1), pp. 160–169. doi: 10.29024/aogh.8.

36. Onda, E. L. (2012) 'Situated Cognition: Its Relationship to Simulation in Nursing Education', *Clinical Simulation in Nursing*. Elsevier Inc, 8(7), pp. e273–e280. doi: 10.1016/j.ecns.2010.11.004.

37. Palen, J. El-Sadr, W., Phoya, A., Imtiaz, R., Einterz, R., Quain, E., Blandford, J., Bouey, P. and Lion, A. (2012) 'PEPFAR, health system strengthening, and promoting sustainability and country ownership', *Journal of Acquired Immune Deficiency Syndromes*, 60(SUPPL.3), pp. S113–S119. doi: 10.1097/QAI.0b013e31825d28d7.

38. Rouleau, G., Gagnon, M.P., Côté, J., Payne-Gagnon, J., Hudson, E., Bouix-Picasso, J. and Dubois, C.A. (2019) 'Effects of e-learning in a continuing education context on nursing care: Systematic review of systematic qualitative, quantitative, and mixed-studies reviews', *Journal of Medical Internet Research*. Journal of Medical Internet Research. doi: 10.2196/15118.

39. Rowe, A. K., Rowe, S.Y., Peters, D.H., Holloway, K.A., Chalker, J. and Ross-Degnan, D. (2018) ‘Effectiveness of strategies to improve health-care provider practices in low-income and middle-income countries: a systematic review’, *The Lancet Global Health*. The Author(s). Published by Elsevier Ltd. This is an Open Access article under the CC BY 4.0 license, 6(11), pp. e1163–e1175. doi: 10.1016/S2214-109X(18)30398-X.

40. Ryan, G. (2018) ‘Introduction to positivism, interpretivism and critical theory’, *Nurse Researcher*, 25(4), pp. 14–20.

41. Simelane, M. L., Georgeu-Pepper, D., Ras, C.J., Anderson, L., Pascoe, M., Faris, G., Fairall, l and Cornick, R. (2018) ‘The Practical Approach to Care Kit (PACK) training programme: Scaling up and sustaining support for health workers to improve primary care’, *BMJ Global Health*. BMJ Publishing Group, 3. doi: 10.1136/bmjgh-2018-001124.

42. Smith, S. U., Hayes, S. and Shea, P. (2017) ‘A critical review of the use of Wenger’s community of practice (CoP) theoretical framework in online and blended learning research, 2000-2014’, *Online Learning Journal*. The Online Learning Consortium, pp. 209–237. doi: 10.24059/olj.v21i1.963.

43. Stein, J., Lewin, S., Fairall, L., Mayers, P., English, R., Bheekie, A., Bateman, E. and Zwarenstein, M. (2008) ‘Building capacity for antiretroviral delivery in South Africa: A qualitative evaluation of the PALSA PLUS nurse training programme’, *BMC Health Services Research*, 8, pp. 1–11. doi: 10.1186/1472-6963-8-240.

44. Watkins, J. A. T., Goudge, J., Gomez-Olive, F.X. and Griffiths, F.(2018) ‘Social Science & Medicine Mobile phone use among patients and health workers to enhance primary healthcare : A qualitative study in rural South Africa’, 198(January), pp. 139–147. doi: 10.1016/j.socscimed.2018.01.011.

45. Wenger, E. (2000) ‘Communities of Practice and Social Learning Systems’, *Organization*. SAGE Publications Inc., 7(2), pp. 225–246. doi: 10.1177/135050840072002.

46. Wenger, E. (2009) ‘Communities of practice: A brief introduction’. Available at: https://www.ohr.wisc.edu/cop/articles/communities_practice_intro_wenger.pdf

47. Wenger, E. and Trayner-Wenger, B. (2015) ‘Communities of practice: a brief introduction’, *April 2015*, pp. 1–8. doi: 10.2277/0521663636.

48. WHO (2013) ‘Transforming and scaling up health professionals’ education and training: World Health Organization guidelines 2013’, *Guidelines*, p. 124. doi: 10.1613/jair.301.

49. World Medical Association (2013) ‘World Medical Association Declaration of Helsinki. Ethical principles for medical research involving human subjects’, *Journal of American Medical Association*, 310(20), pp. 2191–2194. doi: 10.1001/jama.2013.281053.

7. Addenda

Addendum 1: Situated learning characteristics of PACK e-learning

Situated Learning Characteristics (Herrington and Oliver, 1991)		**PACK e-learning Case Application (examples)**
1	"Provide authentic context that reflect the way the knowledge will be used in real-life."	Cases provide not only diagnostic or clinical information but also social and emotional issues that the patient presents with. Provide learning opportunities in the case with regards to systems issues like no medication available or being short-staffed. Scenarios reflect all aspects of real clinic life and influences on daily practice.
2	"Provide authentic activities."	Include options for differential diagnosis and exploring alternatives within the PACK guide.
3	"Provide access to expert performances and the modelling of processes."	Show/discuss how a consultation could be improved with examples in videos integrated into the e-learning cases. If not technically feasible (as in the case of the PDF), suggest practising this together with colleagues.
4	"Provide multiple roles and perspectives."	Include the opportunity to examine a situation from the perspective of colleagues to better understand the community of which the learner is a part e.g. how would a community health worker or lay counsellor experience this patient; how would you work together to treat this patient?
5	"Support collaborative construction of knowledge."	Encourage nurses to work through or discuss cases in pairs or in groups if possible, even though they are electronic. Possibly include a 'team' format within the cases. Offer discussion points embedded within cases that require collaboration with other staff members /cadres.

Situated Learning Characteristics (Herrington and Oliver, 1991)		**PACK e-learning Case Application (examples)**
6	“Provide coaching and scaffolding at critical times.”	Maintain the presence of the Facility Trainer in the training model, to support and encourage use of e-learning cases and provide additional input.
7	“Promote reflection to enable abstractions to be formed.”	Ensure more experienced peers contribute and mentor as part of the training intervention – encourage users to find out more about issues from their colleagues in specialist fields.
8	“Promote articulation to enable tacit knowledge to be made explicit.”	Promote sharing of experience and knowledge across cadres by encouraging discussion or asking questions within the clinic team.
9	“Provide for integrated assessment of learning within the tasks.”	Wrong-answer options offer guidance on how to improve, systematically progress users through the case and question them about page numbers and clinical information. Pre-and post-module tests applied to face-to-face training remain in place as part of the blended model.

Addendum 2: Questionnaire and coding development sheet (2018-2019)

Questions for all participants

Research questions	Interview questions	Overall/specific purpose	Provisional codes or possible themes
	Age, gender,	demographic data; does age influence perspectives on e-learning	Age

Research questions	Interview questions	Overall/specific purpose	Provisional codes or possible themes
• **What access do nurses in clinics have to technology?** • **Does the digital literacy and past online learning experiences of trainees and nurses influence learning?**	Educational level, where and when studies took place	Describe sample group i.e. PHC nurses as end-users	College Vs Uni | resources available in institution | age
	Previous experience with eLearning?	Understand tech experience, literacy and access what type of tools used, experience of this, possible influence on ease of use/comfort in PACK module	Access | IT skills/literacy
	Do you have a smartphone - do you use Facebook/WhatsApp/email on your phone.	access to phone-based eLearning may be more feasible than on a laptop	Access | IT skills/literacy
	Do you know how to use a computer or laptop? How often do you use it (daily/weekly/monthly)? What do you use it for?	if simple activities such as 'click a mouse' may be difficult, then the assumptions around this should be examined closely	speaks to kinds of support required to 'get going'

Research questions	Interview questions	Overall/specific purpose	Provisional codes or possible themes
	Are you able to use the internet or email on a computer/MS Word/Excel?	comfort in these may influence comfort with using the module	Access | IT skills/literacy
	Do you have a laptop or computer at home?	what is day to day access and use of the above like	Access | IT skills/literacy
	Do you have internet access?	if so, how much is it used/level of comfort on various applications	Access | IT skills/literacy
• **How did trainers and nurses respond to the PACK e-learning design?** • **What teaching strategies do trainers use?** • **What are the barriers and enablers to learning for nurses in clinics?** • **How has the situated learning in a community of practice approach been appropriated in PACK e-learning training?**	How did you do the cases? (alone/together with colleagues/with Facility Trainer)	Understanding how the actual learning interaction proceeds - in terms of ease of use and design, as well as how/where/with whom Speaks to the community of practice (COP) that the face-to-face sessions attempts to promote, if it remained necessary	access | preferences | self-directed learning | situated learning| community of practice

Research questions	Interview questions	Overall/specific purpose	Provisional codes or possible themes
	Where did you do the cases? (at clinic/home)		Access | motivation
	Were you able to access computers at the facility?	Is it possible to do the module?	access
	What made you choose to do them like this?	How is learning happening	access | learning preferences | self-directed learning | community of practice
	What was your experience of navigating the cases? E.g. Was it comfortable to read/amount of info per page/ information pitched correctly?	What was the experience of the design of the module	design and learning strategy
	What did you like about them?	What should be retained	design and learning strategy
	What didn't you like? (Anything irritating/annoying/ confusing?)	What requires changing/is difficult	design and learning strategy
	How could the cases better help you to learn? `	Suggestions for changes	design and learning strategy

Research questions	Interview questions	Overall/specific purpose	Provisional codes or possible themes
	Could you copy from memory stick onto the computer easily? Were you able to follow the instructions about how to use the cases? What would make it easier/better?	• How was the module introduced and were the nurses equipped to carry on alone after the trainer left? • Lack of tech ability creates barriers to access - how do we mitigate the various barriers by making it easier to do • Need to understand the details of these potential issues	IT skills/literacy and support available
	Where you able to follow in the guideline while doing the case?	Exploring case presentation, clinical content and interactivity - this is the purpose of the cases - one of the key learning outcomes	Ability to meet learning outcomes | learning strategy
	Were you able to understand the purpose of the cases, reach the outcomes at the end?	Are cases completed successfully, what is the experience of this	Ability to meet learning outcomes | learning strategy
	Was anything confusing, did you get stuck at all?	Probing for any design or content barriers to completion in the cases	Ability to meet learning outcomes | learning strategy
	Did you discuss the cases at all?	Discussion items included in the module to encourage interaction and situated learning	Situated learning | Community of Practice
	If so, did you generate discussion naturally, or did you make use of the discussion points?	Is organic case discussion happening anyway or is it necessary to include the discussion items to generate this	Situated learning |Community of Practice

Research questions	Interview questions	Overall/specific purpose	Provisional codes or possible themes
	How does this experience compare with the usual PACK onsite sessions?	Is this e-learning module seen as an option for the future, is there a preference	Situated learning | Community of Practice |learning preferences
	What is your preference?		Perceptions of eLearning
	What do you think the advantages (and disadvantages) of eLearning are for you as someone working in the clinic?	Understanding context influencing e-learning uptake in PHC	Perceptions of eLearning| access| learning strategy

Additional questions for Department of Health Stakeholders

Research question	Interview question	overall/Specific purpose	Provisional codes or possible themes
What are the perceptions of government stakeholders of the use of educational technology in in-service training?	How would you describe e-learning in the context of health care in South Africa? a. Is there a need? b. Why? c. What is being done about it?	Context, similarities and differences from nurse perspective and experience	Access| IT skills/literacy
	What would you say the advantages and disadvantages of e-learning are for in-service education in Primary Health Care?	Understanding perceived motivation and context for e-learning	perceptions of e-learning| learning strategy
	What are the barriers and enablers to e-learning in PHC?		Motivation | age| access| literacy |time
	Do you have any comments on the medico-legal aspects of eLearning in health care	Awareness/Inclusion of this in e-learning framework and planning	design and learning strategy
	We are working together on a framework for how to train PACK in the future: What are the benefits of the current model, what are your impressions of the e-learning module so far, how do you envisage this growing, and what would the requirements of such modules be in the future?	e-learning design needs for the future	design and learning strategy

Final codes developed and applied to all interviews:

Access to technology - devices, internet and IT support
Digital Literacy
Learning styles/ preferences
Situated learning and Community of Practice (COP)
Self-directed learning
Blended learning
e-learning design and learning strategy/Content/ ability to meet learning outcomes
Perceptions of eLearning
Time
Motivation
Other

Addendum 3: Information Sheet

George Street
Mowbray, 7700
P O Box 34560
Groote Schuur 7937
Tel. No. (021) 406 6979
Fax No. (021) 406 6691
ETHICS REFERENCE NUMBER: 567/2017

Participant information sheet for observation of training sessions, focus group discussions/interviews

Researcher: Daniella Georgeu-Pepper Tel 0832385770

Only people who choose to take part can be included in this study. Please take your time to make your decision about taking part. Please ask the researcher if you have any questions.

Why is this study being done?

The Practical Approach to Care Kit (PACK) training programme combines evidence-based patient-management tool with an educational outreach training programme, focusing on Primary Health Care (PHC) providers in health facilities in South Africa. The need has arisen to move some of the face-to-face facilitation of the training into a more self-directed, onscreen version while maintaining some of the key educational principles and theories already embedded in the training approach.

The opportunity is thus to expand into e-learning using available resources and tools in order to create a context-specific, comprehensive product that speaks to the needs of the very specific end-users i.e. mostly adult nurses. The first area of focus will be to create

onscreen case studies, as these cases form the basis of large part of the training approach and the question is thus - how do we do this in the best possible way?

Extensive development work has been done on the Mental Health module during the course of 2016 -2018, as this is an area receiving heightened focus in PHC currently. This study will evaluate the onscreen cases and inform how they are implemented in the Western Cape and elsewhere in SA and the world. This first version of the cases will be available in an interactive PDF format, and will require the use of a computer.

How many people will take part in this study?

Three PHC facilities, in different areas, who are ready to implement the Mental Health module will be selected, and professional nurses/CNPs or medical officers, including trainers in each of these clinics will be asked to participate in the study.

What will happen if I take part in this research study?

The research will be done as follows: The researcher will spend time with you in your health facility, in an attempt to understand how you have used the onscreen module in your setting. The researcher will observe how you use the onscreen module, as well as ask you some questions about your experiences of using the content. The researcher will not interrupt health facility functions or consultations at any time.

The researcher will take detailed notes during these observations. An audio-recorder may be used during discussions or interviews. Any mention of names will be taken out of the notes once they have been typed up. The information then cannot be traced back to you. These notes will be available to the research team but names will not be recorded on these notes. The same confidentiality applies if sponsors of the study, study monitors or auditors or REC members need to inspect research records.

How long will I be in the study?

The researcher will aim to visit you on 2 – 3 days in the clinic over a period of 2- 3 months. These visits will not be longer than 1.5 – 2 hours long and will be arranged around your own schedule.

What risks can I expect from being in the study?

The study does not pose any risk to you as the participant. Clinical practice by participants using the PACK guideline is according to Western Cape Department of Health policies and guidelines for disease management, including prescription of medication. Meetings, interviews and focus-group discussions will be arranged to ensure facility function and patient care is not interrupted or compromised. Patient care at pilot clinics will not be put at risk as the PACK guide is based on the best available evidence is consistent with national recommendations and will be used only by experienced health practitioners. All research related costs will be covered by the researcher.

The presence of an observer taking notes may make you feel uneasy or upset. You do not have to answer any questions that you do not wish to answer, and you are free to request that the researcher excuse herself at any time

Are there benefits to taking part in the study?

Participants will not be paid for taking part in this study. The study will benefit participants to improve their individual approach and management of clinical cases according to up to date evidence based guidelines. For those completing the module as instructed, a certificate of completion will we awarded after Facility Trainer is satisfied that cases and pre-/post tests are successfully completed. The study has broad public health benefits in promoting more effective training for nurses and promoting improved delivery of care

Will information about me be kept private?

We will make sure that the personal information collected for this study is kept private. We will not use your name on any study documents. We will not use other information that may identify you on any study documents. We will also not use your name or other

information that may identify you in any reports or presentations. Only your consent form will be kept for record.

You will, however, be aware of your colleagues' participation in the study and therefore confidentiality cannot be guaranteed on their behalf.

Will I be paid for taking part in this study?

You will not be paid for taking part.

What are my rights if I take part in this study?

Taking part in this study is your choice. You may choose either to take part or not to take part in the study. You may leave the study at any time. No matter what you decide, there will be no penalty to you in any way. You may also choose to withdraw from the study after the discussion. You can do this by contacting the researcher.

Who can answer my questions about the study?

You can talk to the researcher about any questions you have about this research. You can do this at the time of the observation, interview or focus group. The researcher you will have contact with during this study is Daniella Georgeu-Pepper. Daniella's telephone number is 021 4066979/083 2385770. Daniella's email address is: Daniella.Georgeu-Pepper@uct.ac.za.

Any concerns about the study can also be addressed by the University of Cape Town Ethics committee on 021 650 3002

Addendum 4: Consent form

P O Box 34560
Groote Schuur 7937
Tel. No. (021) 406 6979
Fax No. (021) 406 6691
ETHICS REFERENCE NUMBER: 567/2017

Consent form for observation of Training sessions, focus group discussions/interviews

Researcher: Daniella Georgeu-Pepper Tel 0832385770

I agree to participate in a study exploring the use of onscreen cases for training in the PACK programme. I have had an opportunity to ask questions and discuss this study with the researcher and have received satisfactory answers to my questions. I have also read the subject information sheet provided to me.

I will participate in the study under the following conditions:

- I will allow observation and recording of my use of the onscreen cases
- I will allow study interviews or group discussions to be audio-recorded. I understand that these will be recorded so that nothing is missed and so that my words are not changed or misunderstood. I understand that I can turn off the recorder at any time during the study and that I can refuse to answer any specific question posed by the researcher.
- I agree to allow the research team to use the information gained by my participation in the research in reports and research publications, but understand

that my privacy and confidentiality will be protected and that my name will not be recorded.

- I understand that I have a right to receive and review a written transcript of the interview. After reviewing and discussing the transcript with the researcher, I can suggest changes for accuracy, clarity or add new information.
- I understand that I am free to withdraw from the study at any time without having to give a reason for withdrawing or being prejudiced in any way.

……	……	……
NAME IN BLOCK LETTERS	SIGNATURE	DATE

……
SIGNATURE OF WITNESS

The following should be signed by the Investigator responsible for obtaining consent:

As the Investigator responsible for this research or as a designated deputy, I confirm that I have explained to the participant named above, the nature and purpose of the study being undertaken.

I encouraged him/her to ask questions and took adequate time to answer them.
I am satisfied that he/she adequately understands all aspects of the research, as discussed above

I did not use an interpreter.

……	……	……
NAME IN BLOCK LETTERS	SIGNATURE	DATE

.....

SIGNATURE OF WITNESS

Addendum 5: Interview Guide

(Study explanation, informed consent)

General information, background, access to technology and digital literacy

1. What is your age, observed gender
2. Educational level, where and when studies took place
3. Any previous experience with eLearning?
4. Do you have a smartphone - do you use facebook/whatsapp/email on your phone.
5. Do you know how to use a computer or laptop? How Often do you use it (daily/weekly/monthly)? What do you use it for?
6. Are you able to use the internet or email on a computer/MS Word/Excel?
7. Do you have a laptop or computer at home?
8. Do you have internet access?

PACK e-Learning experience

1. How did you do the cases? (alone/together with colleagues/with Facility Trainer)
2. Where did you do the cases? (at clinic/home)
3. Were you able to access the computer at the facility?
4. What made you choose to do them like this?
5. What was your experience of navigating the cases? E.g. Was it comfortable to read/amount of info per page/ information pitched correctly?
6. What did you like about them?
7. What didn't you like? (Anything irritating/annoying/ confusing?)
8. How could the cases better help you to learn? `
9. Were you able to copy onto the computer easily? Were you able to follow the instructions about how to use the cases? o What would make it easier/better?
10. Were you able to follow in the guideline?

11. Were you able to understand the purpose of the cases, reach the outcomes at the end?
12. Was anything confusing, did you get stuck at all?
13. Did you discuss the cases at all? If so, did you generate discussion naturally, or did you make use of the discussion points?
14. How does this experience compare with the usual PACK onsite sessions?
15. What is your preference?
16. What do you think the advantages of eLearning are for you as someone working in the clinic? (and disadvantages)

Additional questions for Department of Health stakeholders only:

1. Background, qualifications

2. Current work profile.

3. How would you describe elearning in the context of health care in South Africa?

In terms of: is there a need?

Why?

What is being done about it?

1. What would you say the advantages and disadvantages of e- learning are for in-service education in Primary Health Care?

2. What are the enablers?

3. What are the barriers? (possible probes: motivation, age, access, literacy, time

4. Do you have any comments on the medico-legal aspects of e-learning in health care?

5. We are working together on a framework for how to train PACK in the future:

What are the benefits of the current model

What are your impressions of the eLearning module designed so far

How do you envisage this growing, and what would the requirements of such modules be in the future?