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MASTER OF MEDICINE IN SURGERY (M.Med)

Supervisor

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DECLARATION

I, Neha Awasthi, hereby declare that the work on which this dissertation/thesis is based is my original work (except where acknowledgements indicate otherwise) and that neither the whole work nor any part of it has been, is being, or is to be submitted for another degree in this or any other university. I empower the university to reproduce for the purpose of research either the whole or any portion of the contents in any manner whatsoever.

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Date: 25 October 2022

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LIST OF TABLES

ABBREVIATIONS

ACS-NSQIP	American College of Surgeons National Surgical Quality Improvement Program
ACSU	Acute Care Surgery Unit
APACHE II	Acute Physiologic Assessment and Chronic Health Evaluation II
ASA	American Society of Anaesthesiologists
ASOS	African Surgical Outcomes Study
AUC	Area Under the Curve
ECG	Electrocardiogram
EL	Emergency Laparotomy
HIC	High Income Country
ICU	Intensive Care Unit
LMIC	Low- or Middle-Income Country
NELA	National Emergency Laparotomy Audit
NELA-NRPC	National Emergency Laparotomy Audit's New Risk Prediction Calculator
P-POSSUM	Portsmouth Physiological and Operative Society Score
RPC	Risk Prediction Calculator

PUBLICATION READY MANUSCRIPT

COMPARING MORTALITY CALCULATORS FOR EMERGENCY LAPAROTOMY IN CAPE TOWN

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ABSTRACT

Introduction

Emergency laparotomies (EL) are high risk surgeries, a result consistent across multiple national databases and audits. Risk prediction calculators (RPC) were developed to accurately stratify risk of mortality in these emergency patients, often frail prior to surgery. Access to post-operative care including high-care and Intensive Care Unit is limited in LMIC hospitals.

Aims and Methods

To determine the risk of mortality following surgery using three risk prediction calculators – namely National Emergency Laparotomy Audit's New Risk Prediction Calculator (NELA-NRPC), Portsmouth Physiological and Operative Society Score (P-POSSUM), and African Surgical Outcomes Study (ASOS) to 215 patients who underwent non-trauma EL in a tertiary level hospital in South Africa.

Results

Mortality on post-operative day 30 in this cohort was 24.2%. Colorectal resections were most performed and had the highest mortality rate (30.6%). For risk prediction calculators, the NRPC had the largest AUC-ROC (0.86 95% CI, 0.803 to 0.920), followed by P-POSSUM (0.84 95% CI, 0.780 to 0.899), and ASOS (0.806 95% CI, 0.74 to 0.87) having the least.

Conclusion

Our study corroborates findings in preceding literature that certain variables are associated with worse outcomes and mortality - age, intra-operative findings of malignancy and high ASA scores significantly worsening mortality. The NRPC was the most accurate RPC. This can easily be used pre-operatively to estimate the patient's risk of mortality. Using this risk stratification, post-operative high care or ICU care can be solicited, and thus used to ameliorate the irrefutably high rate of mortality. Further improvements can be made by establishing a national laparotomy database with ongoing auditing.

INTRODUCTION

Emergency laparotomy constitutes one of the three "Bellwether procedures" i.e., standardised global indicators of access to emergency and essential surgical care.[1] These procedures are performed world-wide and carry significant morbidity and mortality. The international focus on sustainable development goals, previously known as millennium development goals, has seen an affirmative paradigm shift in multiple dimensions of healthcare. With no such global attention on mitigating surgical disease burden, access to surgery remains neglected, and inevitably, aggravates overall mortality rates.[2]

In 2012, the United Kingdom (UK) instituted the National Emergency Laparotomy Audit (NELA). This is a database to record and monitor the outcomes of emergency laparotomies. At the advent of NELA, the UK had an 11.8% 30-day mortality rate, whereas the USA had a 6.9% mortality rate.[3] A regional study of more relevance by Spence in 2016 showed in-hospital mortality across six hospitals in the South Africa to be 13.4%,[4] while a recent South African study showed an in-hospital mortality rate of 11.1% following non-trauma emergency laparotomies.[5] Thus, in extrapolating 30-day mortality, both in and out of hospital, the rate of mortality could only be higher than both of these reported numbers.

Once established, NELA formulated the New Risk Prediction Calculator (NRPC), modelled on patients in the database between 2014 and 2016, in addition to the existing risk prediction calculators, namely, the ACS-NSQIP (American College of Surgeons National Surgical Quality Improvement Program) and the P-POSSUM (Portsmouth Physiological and Operative Society Score), to improve on accuracy of predicting morbidity and mortality. These scoring systems are useful in their ability to classify patients into risk categories and, in doing so, to allocate resources accordingly, particularly in environments where these are constrained.

As described by Stonelake,[6] the Royal College of Surgeons of England determined that patients undergoing an emergency laparotomy with a mortality risk greater than 5% would require a consultant present at the time of surgery, while a risk exceeding 10% would require consultant review within four hours of admission. This type of rule-based resource allocation can assist in creating a systematic improvement in survivability.

As Soreide defined, "the ideal clinical prediction rule should be easy to use, reliable, have a high generalisability, and be validated adequately both internally and externally."[7] When

comparing the different risk prediction calculators, NRPC and P-POSSUM share many common metrics, although the NRPC factors in the patient's ASA classification and gender, whereas the P-POSSUM does not. Current research indicates that the P-POSSUM scoring system over-estimates mortality in both patient groups (survived and deceased).[8] P-POSSUM, however, is a more accurate calculator in riskier procedures. In comparison, the ACS-NSQIP also has a slightly higher estimated percentage of mortality than did the NRPC, but this difference was statistically insignificant.[8]

A generous search through the literature yielded paltry data on the use of risk prediction calculators in low to middle income countries (LMICs). None of these three scoring systems are used with regularity in South Africa and, accordingly, minimal data exists to determine if these scoring systems made for and in developed countries are reproducible or accurate for LMIC healthcare systems. There also remains a dearth of data on post-operative outcomes following emergency laparotomy in South Africa. In recent years the African Perioperative Research Group has developed the ASOS (African Surgical Outcomes Study) Surgical Risk Calculator. This 6-point risk calculation tool can be used at the bedside to identify patients at greater risk of post operative mortality, with the aim of effortlessly and rapidly identifying a patient who might require more intensive post-operative surveillance. ASOS demonstrated that post-operative mortality of patients in Africa was double the global average, despite a seemingly a lower risk profile.[9]

This South African study is dedicated solely to non-trauma emergency laparotomies and outcomes using RPCs. The aim of this study is to determine whether three RPCs (NRPC, P-POSSUM and ASOS risk prediction calculators), two of which were developed in developed countries, can be used in our setting and secondly, to determine their accuracy in predicting risk of mortality in our LMIC setting. If they prove to be applicable and reproducible, they could be recommended for broader application to achieve systemic improvement, especially in survivability of emergency laparotomies. It can additionally be implemented to identify those requiring high level post-operative care. Due to the nature of the study, the ACS-NSQIP was not included in the analysis because variables such as BMI were not available in the reviewed datasets.

METHODS

Groote Schuur Hospital in Cape Town is one of the two tertiary hospitals in the Western Cape and the Acute Care Surgery Unit (ACSU) undertakes non-trauma laparotomies for surgical emergencies in patients 13 years and older.

Study design and source of data:

This is a single-centre retrospective analysis of data from the ACSU in Groote Schuur Hospital (HREC R020/2018). Patients who underwent an emergency laparotomy were identified from the operative database from April 2017 until May 2018. As per NELA's NRPC guidelines, all variables were collected pre-operatively. The relevant pre-operative data was retrieved from the laboratory system as well as individual patient records, including anaesthetic review, imaging, and ECGs for the remaining clinical parameters.

Data analysis:

Using NELA NRPC, P-POSSUM and ASOS, descriptive statistics, including basic derivatives such as means and standard deviations, were carried out for each risk prediction calculator (RPC) using Stata 16.1(StataCorp. 2019. *Stata Statistical Software: Release 16*. College Station, TX: StataCorp LLC). The risk prediction calculators used by NELA, P-POSSUM and ASOS were then integrated into Microsoft Excel, subsequently deriving scores for each individual patient record. The diagnostic performance of each RPC was calculated using the standard measures of sensitivity and specificity as well as 95% confidence intervals for the estimates. To test the hypothesis that one of the calculators would have better performance in predicting mortality, paired analysis was done between the three RPCs and area under the curve (AUC) comparison. A likelihood ratio analysis and regression analysis were also carried out to evaluate the value in using a combination of the scores to predict mortality.

RESULTS

Retrospective data of 300 consecutive patients who underwent emergency laparotomies at Groote Schuur Hospital ACSU were analysed, of which 215 were included in the study. The NRPC, P-POSSUM and ASOS risk prediction calculators were applied to their data to determine the accuracy of the calculators. The data was incomplete for 41 patients, and these were removed from the analysis.

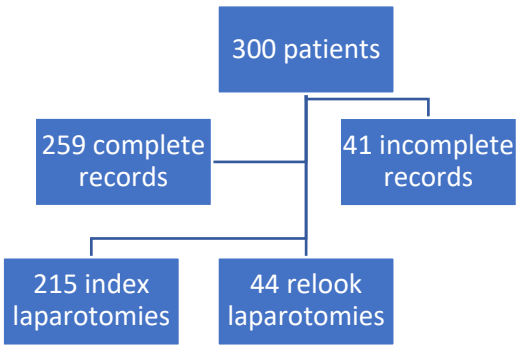

Figure 1. Patient datasets

All emergency laparotomies performed at ACS unit in the aforementioned time frame were reviewed, including laparotomies for intra-abdominal sepsis. All laparoscopic procedures and elective abdominal surgeries, trauma laparotomies and relook procedures were excluded from the study. Emergency laparotomies for specific specialities such as abdominal aortic surgery or gynaecological emergencies were excluded (including obstetric and transplant laparotomies).

There were 112 male and 103 female patients, and the average age was higher amongst the deceased group, 56.9 years vs 48.1 years ($p<0.001$). Seventy-six patients (35.3%) had an American Society of Anaesthesiologists (ASA) score of two, and 18% of all the patients had an ASA four or five (severe systemic disease which is a constant threat to life and moribund). A higher ASA score was significant ($p<0.001$) in contributing to mortality risk. In the patients who survived, the average value of pre-operative urea was 8.2 mmol/L and creatinine of 101mmol/L. The average urea and creatinine were higher in the deceased group (16.5mmol/L and 195mmol/L respectively ($p <0.001$)). The average GCS in the surviving group was 14.7 and 14.0 in the deceased group (p 0.01).

Perioperative data

There was no statistical significant difference in mortality between operations performed during working hours and after hours (p 0.759), or regarding the duration of operation (p 0.393). More consultants were present in the operations of patients who demised (p 0.017). Operative severity of Major vs Major+ alludes to the classification by NELA: Major+ laparotomies include colonic resections, gastrectomies, laparostomy, intestinal bypass, whereas Major laparotomies include stoma formation, small bowel resection and adhesiolysis as well as omentopexies. Between the two groups the risk of mortality was significant ($p<0.001$). Urgency of the case (immediate, urgent, and expedited) was also statistically significant ($p <0.001$). All statistically significant variables for mortality are presented in Table 1.

Table 1 Variables statistically significant for mortality

Variables	[ALL] N=215	Alive day 30 N=163 (76%)	Demised day 30 N=52 (24%)	P-Values
Age	50.2	48.1	56.9	*0.001*
Operative severity				*<0.001*
Major	177 (82.3%)	145 (89.0%)	32 (61.5%)	
Major+	38 (17.7%)	18 (11.0%)	20 (38.5%)	
Expected malignancy				*0.018*
Distant metastases	10 (4.65%)	5 (3.07%)	5 (9.62%)	
Nodal metastases	9 (4.19%)	9 (5.52%)	0 (0.00%)	
None	185 (86.0%)	143 (87.7%)	42 (80.8%)	
Primary only	11 (5.12%)	6 (3.68%)	5 (9.62%)	
Operative urgency				*<0.001*
1. Immediate (<2 hours)	90 (41.9%)	53 (32.5%)	37 (71.2%)	
2A. Urgent (2-6 hours)	73 (34.0%)	61 (37.4%)	12 (23.1%)	
2B. Urgent (6-18 hours)	43 (20.0%)	41 (25.2%)	2 (3.85%)	
3. Expedited (>18 hours)	9 (4.19%)	8 (4.91%)	1 (1.92%)	
Intra-operative consultant presence				*0.017*
Yes	147 (68.4%)	104 (63.8%)	43 (82.7%)	
No	68 (31.6%)	59 (36.2%)	9 (17.3%)	
ASA Score				*<0.001*
1. No systemic disease	38 (17.7%)	37 (22.7%)	1 (1.92%)	
2. Mild systemic disease	76 (35.3%)	68 (41.7%)	8 (15.4%)	
3. Severe systemic disease, not life threatening	62 (28.8%)	41 (25.2%)	21 (40.4%)	
4. Severe, life-threatening	35 (16.3%)	16 (9.82%)	19 (36.5%)	
5. Moribund patient	4 (1.86%)	1 (0.61%)	3 (5.77%)	
Urea (mmol/L)	10.2 (10.2)	8.23 (8.19)	16.6 (13.0)	*<0.001*
Creatinine (mmol/L)	124 (115)	101 (86.0)	195 (159)	*<0.001*
Heart rate	102 (22.1)	99.8 (22.8)	108 (18.5)	*0.01*
GCS	14.6 (1.44)	14.7 (1.13)	14.0 (2.02)	*0.011*
ECG				*<0.001*

AF rate >90 / any other abnormal rhythm/paced rhythm/>5VE/min/Q, ST or T wave abnormalities	29 (13.5%)	14 (8.59%)	15 (28.8%)	
AF rate 60-90	1 (0.47%)	0 (0.00%)	1 (1.92%)	
No abnormalities	185 (86.0%)	149 (91.4%)	36 (69.2%)	
Respiratory and CXR				*<0.001*
Dyspnoea at rest/rate > 30 at rest or CXR: fibrosis or consolidation	60 (27.9%)	30 (18.4%)	30 (57.7%)	
Dyspnoea limiting exertion to <1 flight or CXR moderate COPD	18 (8.37%)	13 (7.98%)	5 (9.62%)	
Dyspnoea on exertion or CXR: mild COPD	38 (17.7%)	33 (20.2%)	5 (9.62%)	
No dyspnoea	99 (46.0%)	87 (53.4%)	12 (23.1%)	

Procedures

The most common operations in this study were colorectal resections, followed by appendectomies and perforated peptic ulcer repairs, as shown in Figure 2. The number of mortalities per procedure is shown in Table 2.

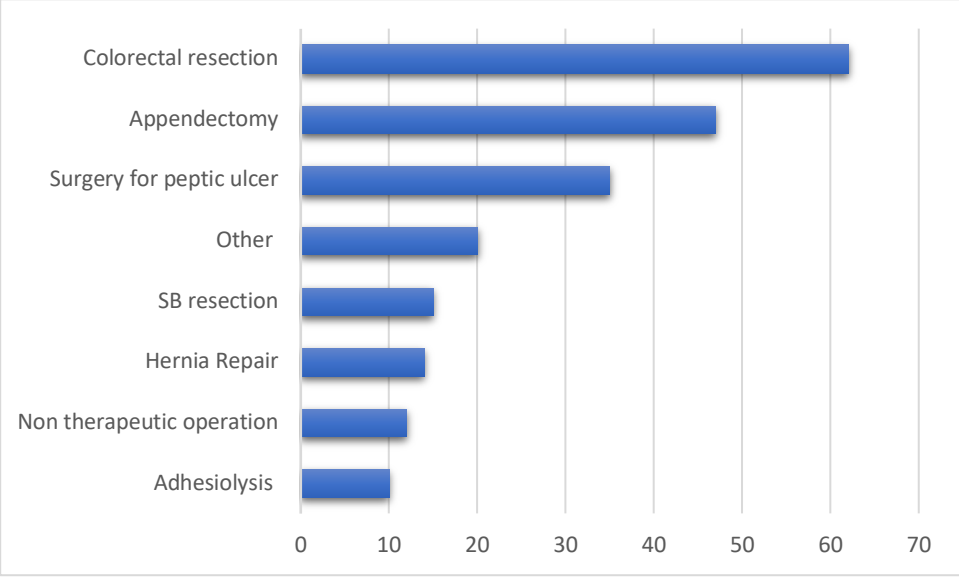

Figure 2. Number of procedures

Table 2. % Mortality amongst procedures

	Total	Deceased	% mortality
Non therapeutic operation	12	8	66.7%
Colorectal resection	62	19	30.6%
Surgery for peptic ulcer	35	9	25.7%
Other	20	5	25.0%
Hernia repair	14	3	21.4%
SB Resection	15	2	13.3%
Appendectomy	47	5	10.6%
Adhesiolysis	10	1	10.0%

Risk Prediction Calculators and risk stratification

With 30 day follow up 163 patients survived (75.8%) and 52 died (24.2%). The average NELA NRPC score for 30-day mortality was approximately 12%, the average P-POSSUM 31.2%, and an average ASOS score of 28%. Patients were further stratified into mortality risk based on the percentage risk of mortality for each RPC (Table 3). Low-risk was classified as <5% mortality, intermediate-risk was 5-10% risk and high-risk constituted the group with more than 10% risk of mortality.

Table 3. Risk prediction calculators per risk groups

		Low risk	Intermediate risk	High risk	Total
NELA	***n***	**119 (55.3%)**	**29 (13.5%)**	**67 (31.2%)**	**215**
	Alive	111	27	25	163
	Deceased (% of risk group)	8 (6.7%)	2 (6.9%)	42 (62.7%)	52 (24.2%)
PPOSSUM	***n***	**45 (20.9%)**	**41 (19.1%)**	**129 (60.0%)**	**215**
	Alive	44	38	81	163
	Deceased (% of risk group)	1 (2.2%)	3 (7.3%)	48 (37.2%)	52 (24.2%)
ASOS	***n***	**13 (6.1%)**	**70 (32.6%)**	**132 (61.4%)**	**215**
	Alive	12	67	84	163
	Deceased (% of risk group)	1 (7.6%)	3 (4.3%)	48 (36.4%)	52 (24.2%)

With NELA RPC, 119 patients fell into the low-risk category of which eight died (6.7% mortality in this risk group). NRPC identified 67 patients as high-risk, of which 42 died (62.7% mortality in this risk group).

In using P-POSSUM, the low-risk mortality group had 45 patients with one mortality (2.2%). There were 129 patients in the high-risk category (60%) with 48 deaths (37.2%).

ASOS classified 13 patients as low-risk, of which one patient died (7.6%). One hundred and thirty-two patients were classified as high-risk, of which 48 died (36.4%).

The NELA risk predictor showed the largest AUC-ROC 0.8614 (95% CI, 0.803 to 0.920) (Figure 2). The next highest AUC was for PPOSSUM at 0.8395 (95% CI 0.780 to 0.899). The lowest AUC was for ASOS 0.806 (95% CI, 0.739 to 0.873).

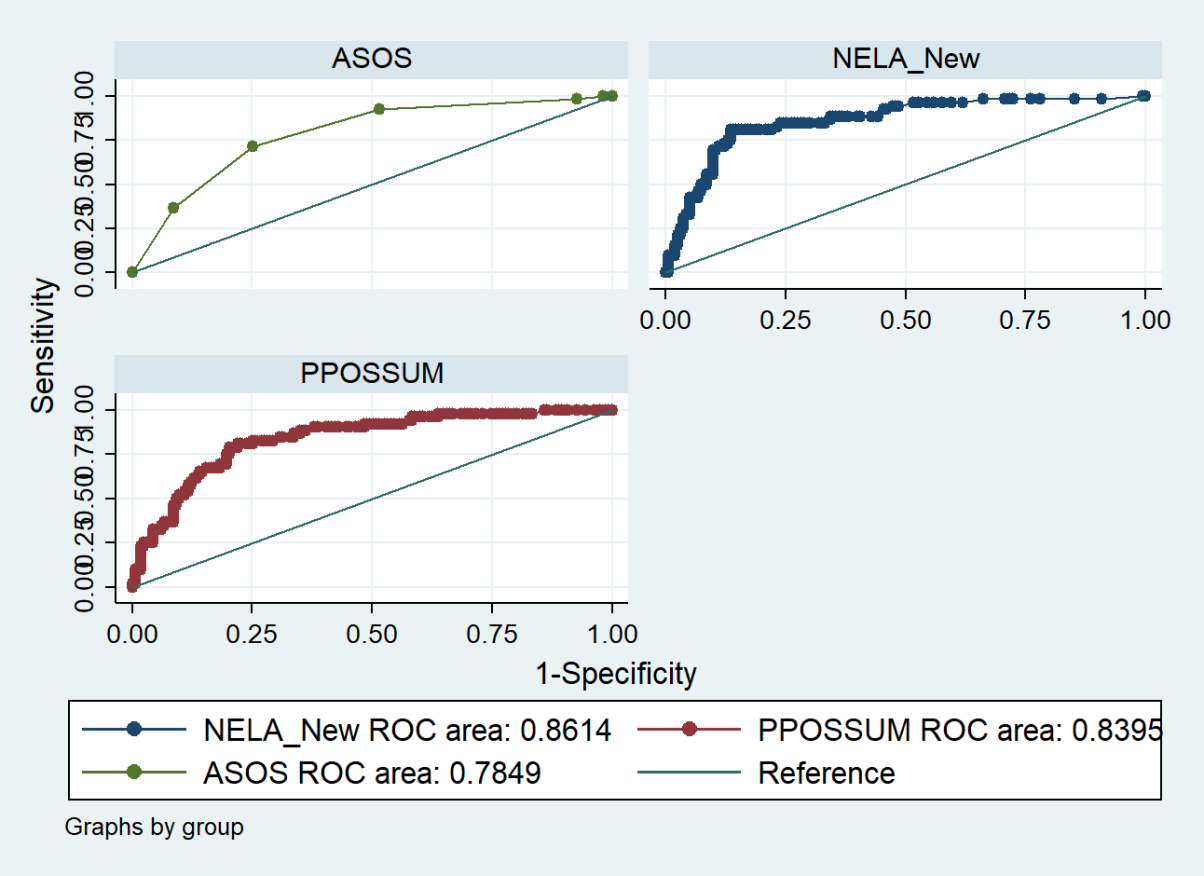

Figure 3. AUC-ROC for all three risk prediction calculators

All pre-operative variables of statistical significance ($p<0.005$) can be seen in Table 3. Variables that had no statistical significance were estimated blood loss, peritoneal soiling, systolic blood pressure, operative time, operative duration, pre-operative haemoglobin, white cell count, cardiac/CXR findings.

DISCUSSION

The emergency laparotomy mortality rate of 24.2% found in this study was higher than international studies. There are multiple contributors to this. Firstly, as the hospital is a referral centre, the cohort of patients are high risk, especially higher anaesthetic risks. Secondly, the resource constraint adds an inevitable delay in access to surgical care. This is further exacerbated by a lack of pre-operative resuscitation in combination with the delayed hospital presentations, thereby potentially increasing the mortality rate. Pre-operatively, these patients were sicker and frailer – shown in the significantly deranged pre-operative values for urea and creatinine.

101 patients (47%) had an ASA score of three or more, and 52 patients (24%) were 65 years or older. Factors such as ASA and older age have been repeatedly linked to worse outcomes and this causality is logical as the ASA score is an anaesthetic pre-operative score which aims to triage risk.[10] This study reproduced the same correlation – a higher ASA score was a risk factor for higher mortality.

Intra-operative finding of malignancy also impacted outcomes – of the 30 patients who had malignancy 10 patients died (a 33.3% mortality in this group). Of the 185 patients who did not have malignancy, 143 patients were alive at day 30, resulting in a mortality rate of 22.7% in this group. Advanced disease, or malignancy for that matter, is likely to result in poorer outcomes with chronic depletion of patients' functional reserve in conjunction with a protracted history of prior illness. Although intuitive to assume surgical outcomes are worse at night, our study found that operative working hours (surgery during or after working hours) did not have a significant impact on outcome, and previous studies have shown the same.[5]

Not all the patient variables were statistically significant. Variables that would instinctively affect outcomes, such as peritoneal soiling, estimated blood loss, and operative duration did not influence mortality in this study. Amongst the group of patients who died, 36.5% had undergone a colorectal resection, 17.3% had surgery for peptic ulcer disease, and 9.6% underwent an appendectomy. The highest rate of procedure-based mortality was seen in the group of patients undergoing colorectal resection – 30.6% of these patients died. The second highest rate of mortality was amongst peptic ulcer disease (25.7%) and could be due to a delay to definitive surgery, but at the moment unproven. Complex appendectomies continue to have a high rate of mortality of 10.6%, despite their frequency, and this study was no different. The

"non-therapeutic operation" group included inevitable mortalities – patients with unsalvageable pathologies, for example, patients with mesenteric ischaemia and intra-operative findings of entirely ischaemic bowel. As such, these were open-and-close laparotomies, with no further surgical intervention and two thirds of these patients died.

The new NELA scoring system (NRPC) is more accurate in predicting mortality ($p<0.001$) in our study. In comparison to the other risk prediction calculators, NRPC had the highest degree of separability (denoted by the highest AUC) – the best ability amongst the three RPCs to distinguish those truly at high risk of mortality from those who were not. P-POSSUM identified many of the high-risk patients correctly. However, mortality in this P-POSSUM high-risk group accounted for 92% of the *overall* mortality, and in doing so also included many of the non-high-risk patients – a more despondent RPC than NRPC. ASOS had the lowest AUC, perchance due to the variability obtained by combining mortality risk with morbidity.

In analysing the 30-day mortality, focus was placed on the overall quality of care. If on-table or in-hospital mortality had been additionally tallied, it may have highlighted other areas of issues such as peri-operative care and anaesthesia.[2] This study did not investigate comorbidities but rather reported on clinical manifestations of comorbidities, such as ECG changes and findings on chest X-rays. In future studies these could be accounted for in further detail to include hypertension and diabetes, as well as HIV status and previous TB, which are comorbidities more prevalent in our system. The actual delay to theatre is not accounted for in the risk calculators, but this data is documented on the operative sheets. Additionally, the delay from primary centre to secondary level hospital to tertiary hospital is also not quantified.

Re-operations were not in the scope of this study as the variables could not be adjusted to account for the second or third re-operations. The inclusion of patients who underwent multiple re-operations and subsequently died resulted in an erroneous calculation of 30-day mortality, invariably skewing the data.

The ACSU manages a complex group of patients with a high risk of mortality. Many of the deaths occurred post-operatively, insinuating a capacity to reduce mortality through vigilant postoperative care for example. Improvement can be made on both surgery-related and patient-related risk factors.[11] Emergency laparotomies need to be given higher priority to access theatre as a delay in operating is directly related to a higher rate of mortality. Interestingly, a few

challenges appear to be consistent across the globe in both HIC and LMICs; in the UK, a third of patients experienced a delay in surgery.[12] As previously demonstrated, adverse outcomes following perforated hollow viscus can be directly co-related to the delay in surgery.[7]

Previous studies from NELA show surgeries with a consultant present had higher mortalities, which indicates accurate identification of the high-risk patients and subsequent consultant presence intra-operatively. In our study, approximately 69% of cases had a consultant present, owing to the consultant driven service at this tertiary institute. In the 7th NELA report, a consultant was present in 90.1% of the cases, and the ensuing improvement in mortality is palpable. If using RPCs, in the instances of cases with higher mortality rates, for example in findings of malignancy, would merit the presence of a consultant in theatre.

Our critical care and high-care resources are limited. This tertiary hospital has 893 beds, of which the surgical ICU offers 8 -12 beds but is highly sought after and is shared amongst all surgical disciplines, as well as other hospitals in the province. Patients with organ failure (and thus higher APACHE II scores) obtain ICU care with more ease than those unwell and pre-organ failure. This latter group of sick patients are largely missed until they acutely deteriorate, when they would have initially benefitted from higher level of care, and ongoing resuscitation and early detection of deterioration. With such resource pressure an accurate scoring system would more accurately triage these patients.

A similarly powered study by Kiernan found an emergency laparotomy mortality rate of 6.66% at their Irish hospital, and with this number in mind, 50% of mortalities were managed in high-care or ICU.[13] In the UK database, 82.3 % of high-risk patients were admitted to critical care.[12] Additionally, the NELA calculator can be incorporated seamlessly into the Acute Care Surgery operative database to reflect mortality risk. Thus, level of care and resources can be apportioned accordingly. Following emergency laparotomy in our resource limited setting, this could then be used for soliciting ICU care or post-anaesthetic high care for patients. By thus stratifying patients' risk correctly using an RPC, post-operative outcomes can be optimised.

ASOS remains a pragmatic bedside tool - its practicality lies in ease and speed with minimal parameters required. However, ASOS only considers categorical data. Its limitation lies in its ability to differentiate between morbidity or mortality outcomes. Further development of this tool could generate more accurate numbers.

It is imperative to risk stratify patients immediately after laparotomy as accurately as possible. A study by Pearse 2006 highlights the higher mortality rate in the cohort of patients admitted to the ward post-operatively first and ICU thereafter.[14] Risk prediction calculators such as the NRPC can predict mortality and hence delineate the need for an ICU bed, based on mortality risk. Another application of NRPC would be in referral centres, in order to improve access to higher level of care.

NRPC was created for the UK but remains useful in our LMIC setting. This study analysed a small cohort – statistics from NELA use a base of more than 20 000 cases per year, whereas this study is a single-institution study, with the bias of being a tertiary centre. Undoubtedly, in the UK, the establishment and successive use of NELA has bolstered and shaped peri-operative care in the cohort undergoing emergency laparotomies. Following the establishment of NELA, the national 30-day mortality rate changed from an initial rate of 11.8% to 8.7%, a significant improvement. [12]

Surgery in Africa is inflicted with high post-operative mortality rates, compared to the global average,[9] with a mortality rate of 24.2% at our institution. The harrowing disparity amongst the outcomes following emergency abdominal surgery in HIC vs LMIC is irrefutable. The establishment of a national laparotomy database should be a national standard, not only to audit and improve mortality outcomes, but also to risk stratify patients with the intent of optimising peri-operative patient and surgical risk factors. Outcomes amongst the national hospitals could be compared, and with the inclusion of more secondary-level and rural hospitals as well, the statistics would be more representative than current data.

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APPENDICES

Appendix 1: Ethics Approval – University of Cape Town Human Research Ethics Committee

UNIVERSITY OF CAPE TOWN
Faculty of Health Sciences
Human Research Ethics Committee

Room G50- Old Main Building
Groote Schuur Hospital
Observatory 7925
Telephone [021] 406 6492
Email: hrec-enquiries@uct.ac.za
Website: www.health.uct.ac.za/fhs/research/humanethics/forms

02 July 2020

HREC REF:352/2020

Dr S Rayamajhi
Department of General Surgery
J-46.49, OMB
Email: shrevi.r@hotmail.com
Student: nez.24@hotmail.com

Dear Dr Rayamajhi

PROJECT TITLE: PREDICTING 30-DAY MORTALITY IN EMERGENCY LAPAROTOMIES IN CAPE TOWN-MMED CANDIDATE-DR NEHA AWASTHI

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

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

This approval is subject to strict adherence to the HREC recommendations regarding research involving human participants during COVID -19, dated 17 March 2020.

Approval is granted for one year until the 30 July 2021.

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

We acknowledge that the student: Dr Neha Awasthi will also be involved in this study.

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

Please note that for all studies approved by the HREC, the principal investigator must obtain appropriate institutional approval, where necessary, before the research may occur.

Please quote the HREC reference number in all your correspondence.

Yours sincerely

Signed by candidate

PROFESSOR M BLOCKMAN
CHAIRPERSON, FHS HUMAN RESEARCH ETHICS COMMITTEE

HREC 352/2020sa

Form FHS006: Protocol Amendment

HREC office use only (FWA00001637; IRB00001938)			
☑ Approved	☑ Type of review: Expedited	☐ Full committee	
This serves as notification that all changes and documentation described below are approved.			
Signature HREC Chairperson / Designee	Signed by candidate	Date	29/3/2021

Note: All major amendments must include a local **PI Synopsis** justifying the changes for the amendment. Please note that incomplete amendment submissions will not be reviewed.

Please email this form and supporting documents (if applicable) in a combined pdf-file to hrec-enquiries@uct.ac.za.

Please clarify your plan for research-related activities during COVID-19 lockdown.

Comments from the HREC to the Principal Investigator:
Note: The approval of this protocol amendment does not grant annual approval. Please complete the FHS016 / FHS017 form for annual approval at least one month before study expiration.

Principal Investigator to complete the following:

1. Protocol information

Date (when submitting this form)	29/03/2021
HREC REF Number	352/2020
Protocol title	PREDICTING 30-DAY MORTALITY IN EMERGENCY LAPAROTOMIES IN CAPETOWN
Protocol number (if applicable)	2020/068
Principal Investigator	SHREYA RAYAMAJHI
Department / Office Internal Mail Address	DEPARTMENT OF SURGERY

1.1 Is this a major or a minor amendment? (see FHS006hlp) Major (tick box) Minor (tick box)	☐ Major	☑ Minor
1.2 Does this protocol receive US Federal funding?	☐ Yes	☑ No

Appendix 2: Intended Journal for Publication – South African Journal of Surgery: Submission Instructions to Authors

CATEGORIES OF SUBMISSIONS

Shorter items are more likely to be accepted for publication, owing to space constraints and reader preferences.

Original articles

Original articles on research relevant to surgery should not exceed 3 000 words, no more than 30 references, with up to 6 tables or figures. A structured abstract under the following headings, Background, Methods, Results, and Conclusions is a requirement and should not exceed 250 words.

MANUSCRIPT PREPARATION

Refer to articles in recent issues for the presentation of headings and subheadings. If in doubt, refer to 'uniform requirements' - **www.icmje.org**. Manuscripts must be provided in **UK English**.

The manuscript should contain the title, abstract, keywords, article text and references.

The title page should be submitted as a supplementary file and should include:

- Qualification, affiliation and contact details of ALL the authors.
- Email addresses of all author must be provided.
- ORCID number of ALL authors must be provided – if authors do not have ORCID, please register at https://orcid.org/.
- Disclaimers: Acknowledgements, Declaration of conflict of interest, Funding declaration, Ethics declaration and ORCID.
- A signed copy of the title page including the declarations must be provided in PDF format. An unsigned copy of the title page MUST be submitted in MSWord format.

Abbreviations

All abbreviations should be spelt out when first used and thereafter used consistently, e.g. 'intravenous (IV)' or 'Department of Health (DoH)'.

Scientific measurements

Scientific measurements must be expressed in SI units except blood pressure (mmHg) and haemoglobin (g/dl). Litres is denoted with a lowercase 'l' e.g. 'ml' for millilitres). Units should be preceded by a space (except for %), e.g. '40 kg' and '20 cm' but '50%'. Greater/smaller than signs (> and 40 years of age) should also be preceded by a space e.g. > 20 years. No spaces should precede ± and °, i.e. '35±6' and '19°C'.

Numbers should be written as grouped per thousand-units, i.e. 4 000, 22 160...

Quotes should be placed in single quotation marks: i.e. The respondent stated: '...' Round **brackets** (parentheses) should be used, as opposed to square brackets, which are reserved for denoting concentrations or insertions in direct quotes.

General formatting

The manuscript must be in Microsoft Word or RTF document format. Text must be 1,5-spaced, in 12-point Times New Roman font, and contain no unnecessary formatting (such as text in boxes, except for Tables). *The manuscript must be free of track changes.*

ILLUSTRATIONS AND TABLES

If tables or illustrations submitted have been published elsewhere, the author(s) should provide consent to republication obtained from the copyright holder.

Tables may be embedded in the manuscript file **and** provided as **'supplementary files'**. They must be numbered in Arabic numerals (1,2,3...) and referred to consecutively in the text (e.g. 'Table 1'). Tables should be constructed carefully and simply for intelligible data representation. Unnecessarily complicated tables are strongly discouraged. Tables must be cell-based (i.e. not constructed with text boxes, tabs or enters) and accompanied by a concise title and column headings. Footnotes must be indicated with consecutive use of the following symbols: * † ‡ § ¶ || then ** †† ‡‡ etc.

Figures must be numbered in Arabic numerals and referred to in the text e.g. '(Figure 1)'. Figure legends: Figure 1: 'Title...'. All illustrations/figures/graphs must be of **high resolution/quality**: 300 dpi or more is preferable, but images must not be resized to increase resolution. Unformatted and uncompressed images must be attached as '**supplementary files**' upon submission (not embedded in the accompanying manuscript). TIFF and PNG formats are preferable; JPEG and PDF formats are accepted, but authors must be wary of image compression. Illustrations and graphs prepared in Microsoft PowerPoint or Excel must be accompanied by the original workbook.

REFERENCES

Authors must verify references from the original sources. *Only complete, correctly formatted reference lists will be accepted.* Reference lists may be generated with the use of reference manager software, but the final document must be delinked from the reference database or otherwise generated manually. Citations should be inserted in the text as superscript, e.g. These regulations are endorsed by the World Health Organization,[2] and others.[3,4-6] The superscript reference number should come after the punctuation mark.

All references should be listed at the end of the article in numerical order of appearance in the **Vancouver style** (not alphabetical order). Approved abbreviations of journal titles must be used; see the List of Journals in Index Medicus. Names and initials of all authors should be given; if there are more than six authors, the first three names should be given followed by et al. First and last page, volume and issue numbers should be given. **Wherever possible, references must be accompanied by a digital object identifier (DOI) link and PubMed ID (PMID)/PubMed Central ID (PMCID).** Authors are encouraged to use the DOI lookup service offered by **CrossRef**. Crossref DOIs should always be displayed as a full URL link in the form https://doi.org/10.xxxx/xxxxx

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Other references (e.g. reports) should follow the same format: Author(s). Title. Publisher place: publisher name, year; pages. Cited manuscripts that have been accepted but not yet published can be included as references followed by '(in press)'. Unpublished observations and personal communications in the text must not appear in the reference list. The full name of the source person must be provided for personal communications e.g. '...(Prof. Michael Jones, personal communication)'.