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GENERAL SURGERY

Time to regional surgical care in rural South Africa

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Background: District hospitals in South Africa have limited surgical capacity and regional hospitals treat most essential surgical conditions. This study aimed to describe the pathway and time to regional hospital surgical care for persons with general surgery conditions (PSC) in South Africa.
Methods: This was a retrospective audit of all persons referred on the Vula Mobile App to the general surgery service at Worcester Regional Hospital (WRH) from 1 January 2019 to 31 December 2019. Outcomes were time to care and the proportion lost to follow-up. Reasons for the proportion lost to follow-up were not reported.
Results: There were 617 index PSC referrals to WRH from 23 health facilities. Of these, 472 (76.5%) were referred from district hospitals and 88 (14.3%) from health clinics. Overall, 171 (27.7%) PSC referrals were handled via online-consultation only, 249 (40.4%) were referred to the WRH outpatient clinic, and 197 (31.9%) for inpatient admission. 133 (53.4%) outpatient referrals were lost to follow-up. One hundred and seventy-nine (29.0%) PSC had an operation at WRH. The median number of days from referral to operation was 28 days (IQR:10–86) for those evaluated in the outpatient clinic and 10 days (IQR: 1–125) for those directly admitted as inpatients.
Conclusion: Most surgical referrals to this South African regional hospital came from district hospitals and were for outpatient conditions. The use of telemedicine allowed triage of one quarter of referrals without the need for face-to-face consultation. Median time to operation was less than a month for outpatients; however, there was a high loss to follow-up. Further studies are needed to understand why many PSC did not access outpatient care.
Keywords: access to surgical care, time to care, regional hospital, mHealth app. South Africa

Introduction

Surgical conditions account for one-third of the global burden of disease.[1] Access to timely surgical care has been limited and inequitable, especially in low-to middle-income countries (LMICs) resulting in large populations without access to essential and emergency surgical care (EESC), key components of universal health coverage.[1] Decentralisation of other chronic medical conditions such as diabetes mellitus, hypertension, and HIV/AIDS has been shown to decrease cost, improve patient satisfaction, and improve outcomes.[2-4]

Decentralisation of surgical care is more challenging because it requires a larger set of resources than non-surgical care including a specialised workforce, functional operating theatre, post-anaesthesia recovery units, and auxiliary services such as radiology, laboratory, blood bank, and pathology services. While the World Health Organization (WHO) has mandated district hospitals (DH) to provide EESC, in many LMICs, including South Africa (SA), these facilities have limited surgical capacity and EESC is mostly provided at regional hospitals.[5,6] Decentralisation of obstetrics care has improved access and decreased mortality but the optimal surgical packages for other conditions at each level of care has not yet been determined.[7] A recent study demonstrated that one third of the DHs in the Western Cape, the most well-resourced province in SA, do not provide surgical care at all and the procedures done at the other DHs are largely limited to caesarean section.[8]

Surgical conditions can be time-sensitive, resulting in increased morbidity and mortality when care is delayed. A global indicator of surgical access is having 80% of a population living within 2 hours of EESC.[1,9] In SA, regional and tertiary hospitals report congested surgical systems and long operative backlogs.[10] The drastic reduction of operations during the COVID-19 pandemic (2020–2022) has worsened this situation. Understanding barriers to access to care for persons with surgical conditions (PSC) and time to operation at current facilities can identify potential needs to redistribute some EESC to DHs. Potential advantages to providing EESC at DHs include care closer to communities, decreased cost, improved patient satisfaction, and better outcomes.

In SA, it is possible that time delays to reaching care can occur for PSCs who first seek care at private practices, community health clinics (CHCs), DHs, or other facilities

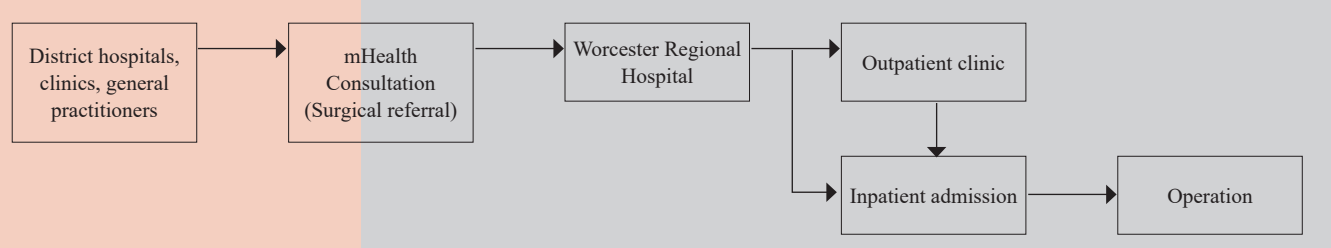

Figure 1: Referral pathway for persons with surgical conditions at a rural regional hospital in South Africa

with limited surgical capacity.[11] The need to be referred to higher level hospitals could delay early and accurate diagnoses and treatment. Not all surgical conditions require operations and determining the proportion that do can help with theatre resource allocation and surgical workforce planning. The aim of this study was to determine the surgical referral pathway including time to definitive treatment for a regional hospital in SA.

Methods

Study site

The Western Cape is one of SA's well-resourced provinces but has large rural areas with sparse geographic surgical coverage. The Cape Winelands East Overberg region covers 21 000 km^2 and is served by a single regional hospital, Worcester Regional Hospital (WRH). Seven DHs, seven CHCs, and numerous private doctors refer PSC to WRH, which has 340-beds and a catchment of over 600 000 persons.[12]

Study design and population

This was a retrospective audit of all PSC referred exclusively using the Vula Mobile App to the general surgery department at WRH from 1 January to 31December 2019. PSC included all persons who were referred to the general surgery service at WRH from lower level facilities such as private practitioners or DHs.

Surgical pathway

Vula Mobile, an mHealth App created specifically for consultation and referral, was used for non-life-threatening cases to make the majority of PSC referrals to WRH.[13] After online consultation between private practitioners, CHCs, DHs, and the WRH surgical team, PSC were either given advice only, a WRH outpatient appointment, or an inpatient transfer (Figure 1). After the outpatient appointment, some PSC were scheduled for subsequent inpatient admission at WRH. Of those admitted, a proportion underwent an operation. The proportion of PSC referred to each stage of the pathway and those lost to follow-up (LTFU) were determined. LTFU was defined as those who were scheduled for an outpatient clinic or inpatient admission but did not show up at the facility.

Data analysis and sources

PSC demographic and surgical pathway data were obtained from the Vula Mobile mHealth App and WRH surgical databases. These electronic databases were prospectively maintained and audited weekly to ensure accuracy. The proportion of PSC referred on the mHealth App who were 1) scheduled and 2) presented to the WRH outpatient clinic, WRH inpatient admission, or had an operation at WRH were identified. Time (days) between referral, outpatient clinic, inpatient admission, and operation were described. Data were stratified by trauma, cancer, referral facility type (CHC, DH, regional hospital, private practitioner), date of referral, referral outcome (online consultation, surgical outpatient, inpatient visit, operation), and type of operation. Only the index operation was included. Time was defined in days. Reasons for LTFU were not recorded. Data were extracted and imported into Stata 16 (College Park, TX, USA). Descriptive statistics (means, median, frequency, and percentages) were calculated as appropriate for the variable normality distribution. To assess associations between categorical independent and dependent variables, the chi-square test was used.

Ethical considerations

Ethics approval was obtained for this study from the Stellenbosch University Human Research Ethics Committee (HREC N21/08/078), and the Western Cape Provincial Ethics (WC_202112_031). Patient consent was waived.

Table I: Persons with surgical conditions referred to a South African regional hospital

Variables	Total *n* (%)	Online consultation *n* (%)	Outpatient *n* (%)	Inpatient *n* (%)	*p*-value*
Total	617 (100)	171 (27.7)	249 (40.4)	197 (31.9)	
Age, yrs (IQR)	52 (35–65)	46 (29–56)	50 (33–64)	54 (35–65)	0.385
Sex					
Male	353 (57.2)	104 (60.8)	133 (53.4)	116 (58.9)	0.272
Female	264 (42.8)	67 (39.2)	116 (46.6)	81 (41.1)	
Trauma	32 (5.3)	17 (9.9)	4 (1.6)	11 (5.8)	0.018
Cancer**	51 (8.5)	11 (6.4)	31 (12.7)	9 (4.8)	0.007

*Outpatient versus inpatient, **Suspected or confirmed

Results

In the 12-month study period, 617 index PSC were referred via Vula Mobile App to WRH, the regional hospital from 23 health facilities. Overall, 264 (42.8%) were female, 353 (57.2%) were male, and the median age was 52 years (interquartile range (IQR), 35–65) (Table I). The proportion of trauma amongst inpatients was higher than in outpatients, (5.8% vs 1.6%, $p = 0.018$) however, a cancer diagnosis was more common in outpatients (4.8% vs 12.7%, $p = 0.007$) (Table I).

Referral pathways

Of the 617 referrals, 472 were from DHs (76.5%), 88 from CHCs (14.3%), and 8 from private doctors (1.3%). Three DHs initiated the majority of the referrals of 292 (47.1%). Online consultation-only was done for 171 (27.7%), 249 (40.4%) PSC were referred to the outpatient clinic, and 197 (31.9%) for inpatient admission (Table II).

Outpatient pathway

Of the 249 referred to the WRH outpatient clinic, only 116 (46.6.%) showed up at the regional hospital giving a LTFU of 133 (53.4%). Excluding LFTU, the median time from referral to outpatient attendance was 39 days (IQR: 16–113) (Table II). In addition, 34 (29.3%) who were seen in the outpatient clinic were subsequently referred to inpatient admission.

Inpatient pathway

Of the 197 referred directly for inpatient admission, 192 (97.5%) arrive at the hospital for admission giving a LTFU of 5 (2.5%). Excluding LTFU, the median time from referral to admission was 4 days (IQR:1–62) (Table II).

Operations

Of 308 surgical referrals that were seen at the regional hospital, 179 (58.1%) had an operation. Of these, 34 (19.0%) came through the outpatient clinic and 145 (81.0%) were direct inpatient admissions.

Table II: Outcome of surgical referrals to a South African regional hospital

Variables	Total *n* (%)	Online consultation-only *n* (%)	Outpatient *n* (%)	Inpatient *n* (%)	*p*-value*
Total	617 (100)	171 (27.7)	249 (40.4)	197 (31.9)	
Referral facility					
District hospital	472 (76.5)	131 (76.6)	174 (69.9)	167 (84.8)	< 0.001
Community health clinic	88 (14.3)	23 (13.4)	45 (18.1)	20 (10.2)	0.056
Intrahospital	24 (3.9)	10 (5.9)	10 (4.0)	4 (2.0)	0.166
Private doctor	8 (1.3)	3 (1.8)	4 (1.6)	1 (0.5)	0.490
Other	25 (4.0)	4 (2.3)	16 (6.4)	5 (2.5)	0.048
Lost to follow-up	-	-	133 (53.4)	5 (2.5)	-
Time (days) to care	-	-	39 (IQR:16–113)**	4 (IQR:1–62)***	-

*Outpatient versus inpatient, **denominator is 116, ***denominator is 192

Table III: Operations on persons with surgical conditions referred to a South African regional hospital[5]

Operations	Total *n* (%)	Outpatient *n* (%)	Inpatient *n* (%)
District level			
Abscess incision and drainage	3 (1.7)	1 (2.9)	2 (1.4)
Amputation	47 (26.3)	4 (11.8)	43 (29.7)
Appendectomy	8 (4.5)	0 (0.0)	8 (5.5)
Biopsy of lumps and other lesions	7 (2.9)	3 (8.9)	4 (2.7)
Circumcision	2 (2.1)	1 (2.9)	1 (0.6)
Excision of lipomas	10 (5.6)	1 (2.9)	9 (6.2)
Hydrocelectomy	2 (1.1)	0 (0.0)	2 (1.4)
Inguinal hernia repair	5 (2.8)	1 (2.9)	4 (2.7)
Non-trauma emergency laparotomy*	6 (3.4)	1 (2.9)	5 (3.5)
Orchiectomy	6 (3.4)	1 (2.9)	5 (3.5)
Skin graft	2 (1.1)	2 (5.8)	0 (0.0)
Emergency thoracotomy	1 (0.6)	0 (0.0)	1 (0.6)
Umbilical/ventral hernia repair	7 (3.9)	1 (2.9)	6 (4.1)
Wart cauterisation	5 (2.8)	3 (8.9)	2 (1.4)
Wound debridement	3 (1.6)	0 (0.0)	3 (2.1)
Non-district level	65 (36.2)	15 (44.3)	50 (34.6)
Total	179 (100)	34 (100)	145 (100)

* Includes emergency bowel repair, resection, oversewing of vascular injury, and splenectomy

The median time from referral to operation was 28 days (IQR:10–86) for outpatients and 10 days (IQR:1–125) for direct inpatient admissions. Of direct inpatient admissions, 29 (15.1%) had an operation on the day of admission. The majority of operations (n = 114, 63.8%) performed at WRH were district level procedures with amputations being the most common. (Table III).

Discussion

Regional hospitals such as WRH currently provide the backbone of EESC in SA. Over 23 facilities made over 600 mHealth surgical referrals to WRH during the one-year study period. Given the shortage of surgical resources including outpatient and inpatient staff, the triage of PSC before in-person consultation allowed WRH surgical teams to focus on PSC who needed additional workup and operations. The novel use of mHealth Apps such as Vula allowed the management of nearly one third of referrals without the need for PSC to travel to the regional hospital. For regional hospitals in rural areas, where surgical teams are managing referrals from DHs with limited surgical services, this type of remote task-sharing is extremely valuable.

Transport has been identified as a barrier to accessing care in SA due to costs and lack of public and private vehicles.[14] MHealth consultation amongst health providers can mitigate this barrier. Non-life-threatening inpatient transfers took a median of 4 days. While reasons for this delay were not always known, lack of beds at the receiving hospital and pending laboratory results were cited as common reasons. Inpatient LTFU was very low likely because these patient were transferred between hospitals. Eight out of 10 of direct inpatient admissions required an operation implying that mHealth can triage those in greatest need. LTFU of outpatient referrals was high but specific reasons are unknown and warrant investigation. In other studies, we have identified that barriers to reaching surgical care included the high cost or lack of transport.[14] In addition, it is also possible their surgical condition worsened, resolved, or they sought care in the private health sector.

Despite reasonable time to reach and receive care at a regional hospital, PSC from this rural region could benefit from improved DH surgical services. The DH should be the backbone of EESC as recommended by the Lancet Commission,[15] yet, many surgical conditions in SA cannot be treated at rural DHs because they lack the infrastructure and expertise to perform the necessary operations.[11,12] Barriers to accessing surgical care at a DH include the lack of physical resources and the maldistribution of specialised surgical services or workforce to perform time-critical operations.[11,15-17] Our previous study classified operations done as district or non-district level based on the South African National Department of Health District Health Package.[5,18] Using this framework, the majority of operations performed on PSC referred on Vula were district level operations. This was likely because of a lack of DH surgical capacity. For example, amputation was the most common district level operation done at the WRH but DHs do not routinely have the ability to perform this procedure.[8]

Innovative strategies to sustainably improve the existing surgical workforce at DHs and regional hospitals are crucial if access and delivery of surgical care are to improve in SA.[19] One strategy to improve the timeliness of surgical care is the decentralisation of surgical services to DHs.[5] This could be done with hub-and-spoke models to support DHs who do not have surgeons or anaesthesiologists. Well-defined baskets of surgical care for each DH and identification of gaps in current skills could tailor in-service training and virtual consultations. In addition, outreach could include supervised elective operating lists to build capacity.[20,21]

This study had some limitations. Firstly, diagnoses were coded by reading mHealth text-chats which may not be ultimately accurate. In 2019, Vula Mobile was not used exclusively for referrals and thus these results are not reflective of PSC referred via other methods. Time to care and need for operation were not stratified by condition type. Also, due to the retrospective study design, some data were missing or conflicting. Next, this study was on referrals to one regional SA hospital, therefore findings may not be generalisable nationally or across other settings. Also, we did not investigate time delays before PSC reached a health facility which could affect overall time to care. Lastly, reasons for LTFU or patient outcomes were unknown. A future qualitative study may delineate more specific reasons for the high LTFU. Nonetheless, the results of this study have the potential to help better understand the impact of timely surgical care which is an important first step to mitigating delays to reaching and receiving surgical care to benefit the most vulnerable persons in rural settings. In addition, a further use of these mHealth data would be to identify gaps in surgical skills and target capacity building at these hospitals.

Conclusion

In summary, this study uses novel mHealth data to demonstrate time to reaching and receiving definitive surgical care in rural SA. Many operations done at this regional hospital were district-level and could possibly be decentralised with appropriate training and support. This could improve access and reduce time to EESC care and allow regional hospital specialists to focus on more complex conditions. Further studies should focus on reasons for delays and LTFU as well as possible improvement of DH surgical capacity.

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Conflict of interest

The authors declare no conflict of interest.

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Ethical approval

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