



Bellwether operations in KwaZulu-Natal Province, South Africa, are performed at regional and tertiary rather than district hospitals

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Background. Previous work from KwaZulu-Natal (KZN) Province, South Africa, has suggested that public sector district hospitals are not providing adequate access to surgical care in the form of bellwether operations (caesarean section (CS), open reduction of fractures (ORF) and laparotomy).

Objectives. To review the surgical output of regional and tertiary institutions, to quantify their contribution to providing bellwether procedure coverage for the province.

Methods. Data on bellwether operations conducted at all district, regional, tertiary and central hospitals in the public health sector of KZN for the period 1 July - 31 December 2015 were collected from operating theatre registers.

Results. Between 1 July and 31 December 2015, a total of 20 926 CSs, 3 947 laparotomies and 3 098 ORFs were performed in KZN provincial hospitals. This translates to a provincial rate for each bellwether procedure of 192/100 000 (CS), 36/100 000 (laparotomy) and 28/100 000 (ORF). The rate of bellwether operations across the province during the study period was 256/100 000, with numbers as follows: CSs – 10 542 in district hospitals, 8 712 in regional hospitals, 1 538 in tertiary hospitals and 134 in the central hospital; laparotomies – 235 in district hospitals, 2 314 in regional hospitals, 1 259 in tertiary hospitals and 139 in the central hospital; and ORFs – 196 in district hospitals, 1 660 in regional hospitals, 1 201 in tertiary hospitals and 41 in the central hospital.

Conclusions. Regional and tertiary hospitals are performing the bulk of non-obstetric bellwether operations in KZN. This imbalance has major implications for planning future delivery of surgical care in the province.

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The Lancet Commission on Global Surgery (LCOGS) has highlighted the fact that barriers to access to safe and effective surgery and anaesthesia in low- to middle-income countries translate into significant morbidity, expense and mortality.^[1,2] South Africa (SA) is a middle-income country with historical discrepancies in wealth, income and access to healthcare. Since the advent of democracy, there has been a concerted effort to address these discrepancies by providing universal access to quality healthcare regardless of income level or geographical location. The chosen method to achieve this is the primary healthcare approach that emphasises prevention rather than curative services and strives to deliver care at a local community level.^[3,4] Surgical services do not easily fit into this approach, however, as it is difficult to prevent surgical illness, and surgical care is by nature complex and reliant on a fairly advanced support infrastructure that must include anaesthesia, postoperative care and radiology services.^[5,6]

The LCOGS developed the concept of bellwether operations as a metric that uses information on a small number of procedures to provide an overview of the overall state of surgical care in a region. The idea was taken from the concept in politics of using the voting trend in a small geographical region to predict broader voting patterns. The LCOGS proposed that caesarean section (CS), open reduction of fractures (ORF) and laparotomy be used as bellwether

operations. Bellwether operations do not reflect quality of care, but merely the capability of an institution. A surgical service is deemed adequate if the entire population is able to access all three of the bellwether procedures within 2 hours. It is assumed that if one of the bellwether procedures can be performed, the skills required to perform that procedure can easily be transferred across to the other procedures.

A recent analysis of operations performed in the district hospitals in KwaZulu-Natal (KZN) Province, SA, showed that while CSs were commonly performed in all the public sector district hospitals in the province, almost no laparotomies or ORFs were being done in these institutions.^[6] It was unclear from that original work where the non-obstetric bellwether procedures were being performed.

Objectives

To analyse all the bellwether procedures undertaken in KZN, to see which institutions are performing them and to establish a rate of each bellwether procedure per 100 000 population.

Methods

KZN is situated on the eastern seaboard of SA and has an area of 94 361 km² and a population of just over 10 million people. It has a densely inhabited coastal area around the port city of Durban as well

as a number of other urban conurbations, namely Pietermaritzburg in the Midlands, the Ladysmith/Newcastle area in the north-west, and a large port at Richards Bay, 2 hours north of Durban. However, about half of the population is rural and lives in districts with high poverty and inequality indices. There are 37 district hospitals, 12 regional hospitals, 3 tertiary hospitals and a single central quaternary centre in the province.

This study describes the bellwether operations conducted at all district, regional, tertiary and central hospitals in the public health sector of KZN for the period 1 July - 31 December 2015. Data were collected from operating theatre registers. The variables collected included the district in which the hospital is situated, the name of the operation, the date of the operation, and the outcome of the operation if available. The data were entered onto an Excel database (Microsoft, USA) by staff in the Epidemiology Unit of the KZN Department of Health and checked and cleaned by authors EEL and AT. The percentage of each bellwether operation at each level of hospital care was calculated. Furthermore, the number of bellwether procedures per 100 000 catchment population was calculated per level of hospital care, for the province as a whole.

The study was approved by the Biomedical Research Committee of the University of KwaZulu-Natal (ref. no. BE528/16) and by the KZN Health Research and Knowledge Management Unit (ref. no. KZ_2016RP21_975).

Results

Between 1 July and 31 December 2015, a total of 20 926 CSs, 3 947 laparotomies and 3 098 ORFs were performed in the district,

regional, tertiary and central public sector hospitals of KZN. This translates to a rate for each bellwether procedure of 192/100 000 (CS), 36/100 000 (laparotomy) and 28/100 000 (ORF). The rate of bellwether operations across the province during the study period was 256/100 000, with numbers as follows: CSs – 10 542 in district hospitals, 8 712 in regional hospitals, 1 538 in tertiary hospitals and 134 in the central hospital; laparotomies – 235 in district hospitals, 2 314 in regional hospitals, 1 259 in tertiary hospitals and 139 in the central hospital; and ORFs – 196 in district hospitals, 1 660 in regional hospitals, 1 201 in tertiary hospi-

tals and 41 in the central hospital. The rate of each bellwether procedure conducted at each level of hospital care is shown in Fig. 1. Table 1 shows the absolute numbers of each individual bellwether procedure over the 6-month study period, as well as the combined number of procedures at each level of institution. Table 2 shows the rate of each individual bellwether procedure as well as the combined number of procedures per 100 000 population for each level of institution.

Discussion

The bellwether operations, i.e. laparotomy, ORF and CS, have been proposed as proxy

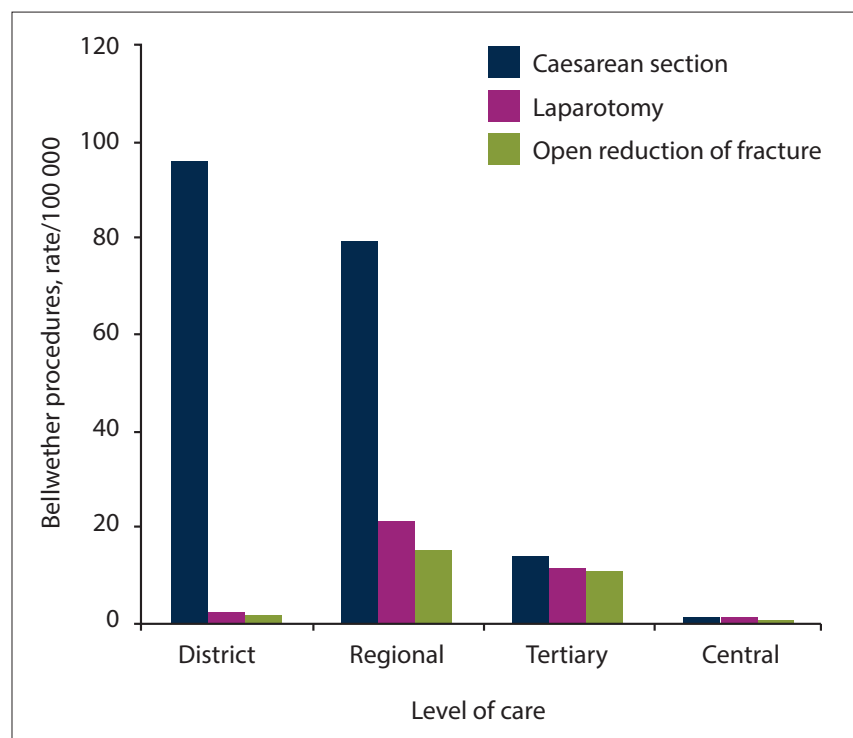


Fig. 1. Rate of bellwether procedures according to level of hospital care.

Table 1. Absolute number of procedures per level of institution

Level of institution	Caesarean section	Laparotomy	Open reduction of fracture	Bellwether procedures
District	10 542	235	196	10 973
Regional	8 712	2 314	1 660	12 686
Tertiary	1 538	1 259	1 201	3 998
Central	134	139	41	314
Total	20 926	3 947	3 098	27 971

Table 2. Rate of bellwether procedures, per 100 000 population*

Level of institution	Caesarean section	Laparotomy	Open reduction of fracture	Total bellwether procedures
District	96.5	2.2	1.8	100.5
Regional	79.8	21.2	15.2	116.2
Tertiary	14.1	11.5	11.0	36.6
Central	1.2	1.3	0.4	8.6
Total	191.6	36.1	28.4	256.2

*Catchment population 10 919 100.^[14]

metrics to quantify access to surgical care.^[1,7,8] A well-functioning surgical system should be able to ensure that each patient in a geographical area has access within 2 hours to an institution capable of delivering any one of the three procedures. We have previously shown that the district hospitals of KZN perform CSs, but deliver the other two bellwether procedures to a very limited extent.^[6] In that study, we found that a total of 18 871 operations were performed at 37 district hospitals in KZN from July to December 2015.^[6] Of the bellwether procedures performed at these institutions, 96.1% were CSs, 2.1% were laparotomies and 1.8% were ORFs. For almost all these district hospitals, the percentage of laparotomies and ORFs performed was small to negligible, while the percentage of CSs was high. This finding implies that there is a barrier to access to the non-obstetric bellwether procedures in KZN, and there is evidence to suggest that these barriers to access translate into worse outcomes for patients with emergency general surgical conditions such as acute appendicitis.^[9-11]

The present study shows that non-obstetric bellwether procedures are being delivered in the regional and tertiary hospitals of KZN. This finding raises an important philosophical question around the primary healthcare approach to the delivery of surgical care. The primary healthcare philosophy advocates a preventive approach and prioritises the delivery of care as close to the patient's home as possible.^[1-4] The first level of care in SA includes the clinic and the district hospital. Surgery does not easily fit into this approach, as it is difficult to prevent the development of a surgical pathology.^[5] The primary health focus of surgical disease is on so-called secondary prevention, which aims to reduce the impact of the surgical condition by prompt diagnosis and management.^[1-4] Surgical care is by definition complex and multimodal. Surgical, perioperative and anaesthetic care must be delivered safely and effectively, and doing this requires a major investment in human resources and infrastructure.

The delivery of surgical care at district level appears to be limited, as evidenced by the fact that the non-obstetric bellwether procedures are being performed mainly in the regional and tertiary institutions. A review of the surgical workload at one tertiary hospital shows that it is currently delivering a significant volume of district-level surgical care.^[12] Placing this district-level burden on institutions that are funded and mandated to deliver higher-level services means that resources cannot be allocated appropriately.^[12]

Improving access to bellwether procedures at district level will necessitate an increase in the capacity of district institutions to deliver surgical care. Staff in these institutions will need to be upskilled, and infrastructure in the form of operating theatres, postoperative monitoring, rehabilitation services and imaging services will need

to be provided. This challenge may be formidable, and maintaining the quality of these services across diverse and geographically remote institutions will be difficult.^[13]

Conclusions

Non-obstetric bellwether operations are being performed to a very limited degree at district hospitals in KZN, but are being performed at regional and tertiary institutions. This imbalance has major implications for strategic planning around the delivery of surgical care in the province.

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