

Safety Culture and Perioperative Quality at the Volta River Authority Hospital in Akosombo, Ghana

Katherine Smiley¹ · Love Ofori² · Cindy Spangler¹ · Rebecca Acquah-Arhin² · Deborah Deh³ · Juliana Enos³ · Stephen Manortey³ · Frank Baiden⁴ · Samuel Finlayson¹ · Raymond Price¹ · Marta McCrum¹

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Abstract

Background The Volta River Authority Hospital (VRAH) is a district hospital associated with a large public works project in Akosombo, Ghana, that has developed a reputation for high-quality care. We hypothesized that this stems from a culture of safety and standardized processes typical of high-risk engineering environments. To investigate this, we evaluated staff and patient perceptions of safety and quality, as well as perioperative process variability.

Materials and methods The Safety Attitudes Questionnaire (SAQ) and Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) surveys were used to evaluate staff and patient perceptions of safety. Perioperative general surgery and obstetrical procedure observations generated process maps, which were analyzed for variability and waste.

Results Thirty-one SAQs were administered. 83% of workers held a positive perception of teamwork, and 77.4% held a positive perception of safety culture. Fifteen HCAHPS surveys of surgical inpatients showed a median hospital rating of 10 [IQR 8.5–10] on a ten-point scale. 90% gave maximal scores for pain management and 84.4% for nurse communication. Ten general surgery and obstetrical procedures were observed for which process map analysis was notable for no consistent waste steps and 100% adherence to the World Health Organization Safe Surgery Checklist.

Conclusions Surveys suggest an institutional commitment to safety with strong teamwork culture and patient communication. Perioperative process mapping supports this culture, with low levels of variability and waste, and is useful for evaluating standardization of care. VRAH demonstrates the feasibility of delivering high standards of perioperative care in a low-resource setting.

Introduction

Over the past decade, a large body of work has drawn attention to the global burden of surgical disease and the approximately 5 billion people who lack access to timely and reliable surgical care [1, 2]. Alongside efforts to improve available resources and personnel, increasing attention is being given to improving quality and safety of care in low- and middle-income countries (LMICs) [3]. Research has shown that developing nations share a disproportionate burden of medical harm, with higher adverse event rates than high-income countries, of which 83% are estimated to be preventable and 30% associated with

✉ Marta McCrum
marta.mccrum@hsc.utah.edu

¹ Department of Surgery, University of Utah Center for Global Surgery, 30 N 1900 E, Rm 3B110 SOM, Salt Lake City, UT 84132, USA

² Electro Volta House, Volta River Authority Hospital, 28th February Road, P.O. Box MB 77, Accra, Ghana

³ Ensign College of Public Health, P.O. Box AK 136, Akosombo, Eastern Region, Ghana

⁴ Faculty of Infectious and Tropical Diseases, London School of Hygiene and Tropical Medicine, Keppel Street, London WC1E 7HT, UK

patient mortality [4, 5]. Ensuring the quality and safety of surgical care is therefore an essential component of increasing global surgical capacity.

In LMICs, there is a need to develop low-cost systems that promote the delivery of high-quality surgical care, yet to date there is a paucity of data on how a low-resource hospital can optimize their available resources to achieve this goal. Research has shown safety culture, teamwork and communication to be associated with improved outcomes in a variety of clinical settings [6–10]. In surgery, an institution's culture often manifests in its perioperative processes. Therefore, fostering an environment with a strong safety climate may be one method by which low-resource hospitals can increase their quality of surgical care.

Examining high-performing LMIC hospitals in terms of safety culture may reveal policies and processes that can be disseminated to other institutions in low-resource settings. The Volta River Authority Hospital (VRAH) is a district hospital in Akosombo, Ghana, with a regional reputation for providing high-quality care to a largely rural population. As the health care component of a large hydroelectric corporation founded in the 1960s, the VRAH has uniquely developed as a hospital within an engineering environment and remains under the larger management of the corporation. It maintains a close relationship with the engineering component of the corporation with regard to institutional safety. We hypothesized that their ability to provide high-quality care stems from an underlying culture of safety and process standardization typical of high-risk engineering environments. We therefore sought to evaluate staff and patient perceptions of safety and quality of care, as well as the degree of perioperative process standardization and variability in common operative procedures.

Materials and methods

Study location

All patient and staff surveys and perioperative observations took place at the VRAH in Akosombo, Ghana, between April 1 and 15, 2017. The VRAH is a 63-bed district hospital with a full range of services, including general surgery and obstetrics/gynecology (OB/GYN) [11].

Survey instruments

The Safety Attitudes Questionnaire-Short Form (University of Texas-Houston) is a validated instrument used to measure attitudes and perceptions in various safety-related domains in healthcare and has previously been used to evaluate safety and teamwork in the surgical environment

[12–14]. Employees were selected to represent a variety of perioperative work settings, levels of experience and authority. Responses were recorded on a five-point Likert scale (1 = disagree strongly, 2 = disagree slightly, 3 = neutral, 4 = agree slightly, 5 = agree strongly). The written survey was administered in English and scored according to published guidelines, averaging the Likert scale scores for each sub-domain, and reporting as a mean percentage [15]. Responses were regarded as “positive” if the score was 75% or greater.

The Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) Survey from the Centers for Medicare and Medicaid Services (CMS) [16] is a standardized, publicly reported survey of inpatient hospital care experience, and is a widely used measure of patient-centered outcomes in the USA [17]. The survey was adapted in accordance with our study setting and population: Of the 32 questions, three demographics-related questions were removed due to irrelevance in the African context (HCAHPS Questions 30–32); three questions were modified to reflect the operational structure of VRAH (HCAHPS Questions 4, 8 and 9); and the question regarding level of education was altered to reflect standard levels of schooling in Ghana (HCAHPS Question 32). We used standard methods to combine the results from the care experience and environment questions into 6 composite measures: nurse communication, responsiveness of hospital staff, pain management, medication communication, discharge information and room cleanliness. Overall satisfaction was assessed on a scale of 1–10 (with 10 as the best possible score) and willingness to recommend the hospital. The survey was scored according to CMS guidelines for Top-Box scoring, and the percentage of respondents giving the highest possible rating in each composite category, a 9- or 10 on “willingness to recommend,” or “definite” willingness to recommend was reported [16]. The adapted survey was administered to a convenience sample of patients from the surgical and obstetric wards immediately prior to discharge, of whom all except one spent at least one overnight in hospital. All patient surveys were administered verbally in English by a member of the research team, and an independent medical translator was utilized as needed.

Perioperative observations and process maps

Perioperative observations were carried out for ten surgical cases over 3 days at VRAH. Cases included elective and emergent general surgical and obstetric procedures and provided a representative sample of operative cases typical of the average weekly volume of the hospital. Observations were performed without direct interaction between observers and staff to minimize deviation from standard

procedures. Observations focused on the individual roles and order of actions for each surgical team member and were collated to create two process maps: one for general surgery procedures and another for obstetrical procedures. Evaluation for waste steps was independently performed by three investigators and reviewed for agreement. Final process maps were generated by a trained process engineer.

Statistical analysis

Respondent characteristics were summarized using proportions for discrete variables. Survey scoring was performed according to published guidelines, with results either calculated as mean values and presented as percentages, or calculated as median scores out of 100 and interquartile ranges (IQR). The Cronbach's alpha was calculated for each domain of the SAQ to assess for internal consistency. Analysis was conducted with SAS version 9.4 (SAS Institute, Cary NC).

Ethical approval and consent procedure

Prior to the study period, patients and staff were provided with a waiver of written consent and given the opportunity to verbally consent to or decline participation. All survey participants were assured of the confidential nature of the questionnaire and completed the questionnaire in a private setting. The study was approved by both the Ensign College of Public Health/VRA Hospital Ethics Committee and the University of Utah's Institutional Review Board (approval #00099734).

Results

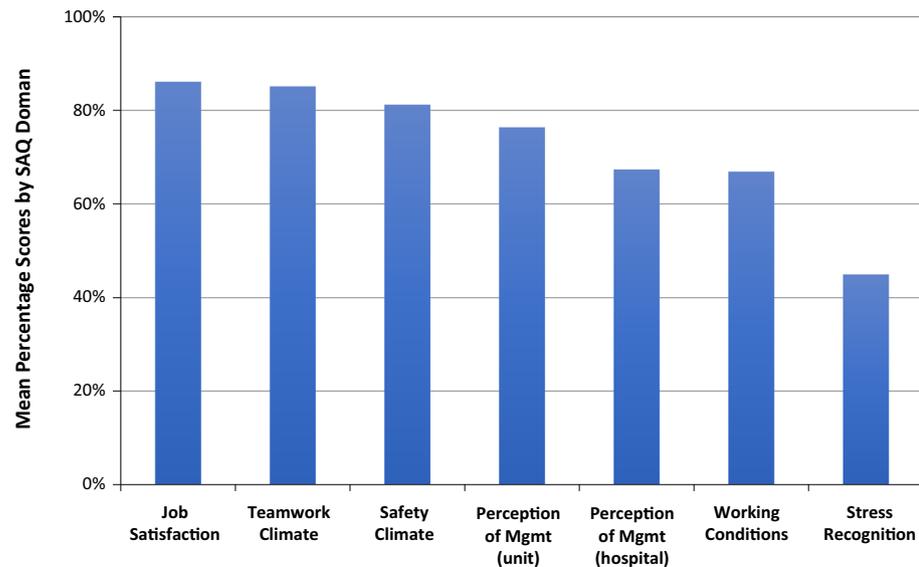
Employee Safety Attitudes Questionnaire: Thirty-one staff surveys were completed by employees of VRAH. Survey respondents represented a range of roles within the peri-operative team, including 2 (6.5%) physicians/surgeons, 9 (29.0%) nurses and 1 (3.2%) anesthesia providers (Table 1). 74% of respondents had greater than 2 years of employment at VRAH, with the longest-serving respondent having greater than 21-year experience. The missing answer response rate for the overall SAQ was 5.0% with 64 of 1271 items unanswered in the overall cohort. Domains of the SAQ with the highest proportion of "positive" responses were job satisfaction (median score 90, [IQR 75–95]), teamwork climate (91.67, [83.3–95.8]) and safety climate (85.7, [79.2–92.9]) (Fig. 1). Stress recognition was the lowest scoring domain, with the greatest proportion of neutral or negative responses (43.75, [18.8–68.8]). Cronbach's alpha scores of 0.84 for teamwork, 0.73 for safety climate, 0.85 for stress recognition and 0.75 for

Table 1 Employee survey demographics

<i>Sex</i>	
Female	20 (64%)
Male	8 (26%)
Unreported	3 (10%)
<i>Department</i>	
Surgery	5 (16.1%)
Medicine	3 (9.8%)
Anesthesia	1 (3.2%)
Ophthalmology	1 (3.2%)
Radiology	1 (3.2%)
Ancillary services	5 (16.1%)
Administrative	4 (12.9%)
Unreported	11 (35.4%)
<i>Position</i>	
Nurse	9 (29.0%)
Administrator	5 (16.1%)
Technologist	3 (9.8%)
Physician	2 (6.4%)
Pharmacist	2 (6.4%)
Nurse practitioner	1 (3.2%)
Housekeeper	1 (3.2%)
Physical therapist	1 (3.2%)
Unreported	6 (19.4%)
<i>Length of employment</i>	
6–11 months	4 (12.9%)
1–2 years	1 (3.2%)
3–4 years	3 (9.8%)
5–10 years	2 (6.4%)
11–20 years	6 (19.4%)
21+ years	12 (38.7%)
Unreported	3 (9.8%)

management reflected acceptable internal consistency. Assessments of work conditions demonstrated lower internal consistency with Cronbach's alpha of 0.49.

Patient Assessment of Healthcare System: Fifteen patients completed HCAHPS surveys, with even sex distribution, of whom 54% were <40 years of age (Table 2). Survey responses demonstrated high percentages of Top-Box scores in several categories including 90.0% for the pain management and 84.4% for nurse communication (Fig. 2). The two lowest scoring categories were discharge information (55.6%) and medication communication (31.3%). 93.1% of respondents stated they would "Definitely Recommend" VRAH. The median overall rating was 10 [IQR 8.5–10] on a ten-point scale, with 73.3% of respondents scoring VRA Hospital as 10/10.

Fig. 1 Mean percentage scores of staff on each domain of the Safety Attitudes Questionnaire**Table 2** Patient survey demographics

<i>Age (years)</i>	
21–30	4 (26.6%)
31–40	4 (26.6%)
41–50	1 (6.7%)
51–60	2 (13.3%)
61–70	2 (13.3%)
71+	0 (0%)
Unreported	2 (13.3%)
<i>Patient sex</i>	
Female	7 (46.6%)
Male	7 (46.6%)
Unreported	1 (6.7%)
<i>Highest educational level</i>	
Elementary or less	5 (33%)
Some middle/high school	3 (20%)
High school graduate	4 (26.7%)
Some university	1 (6.7%)
University graduate	2 (13.3%)
Unreported	0 (0%)
<i>Translator needed</i>	
Yes	7 (46.6%)
No	5 (33.3%)
Unreported	3 (20%)

Perioperative Observations: Perioperative observations of 7 general surgeries and 3 obstetrical procedures confirmed a high level of procedural consistency and minimal process variability, as depicted by two process maps (Fig. 3a, b). General surgery procedures included breast lumpectomy, circumcision and hernia repair. Obstetrical

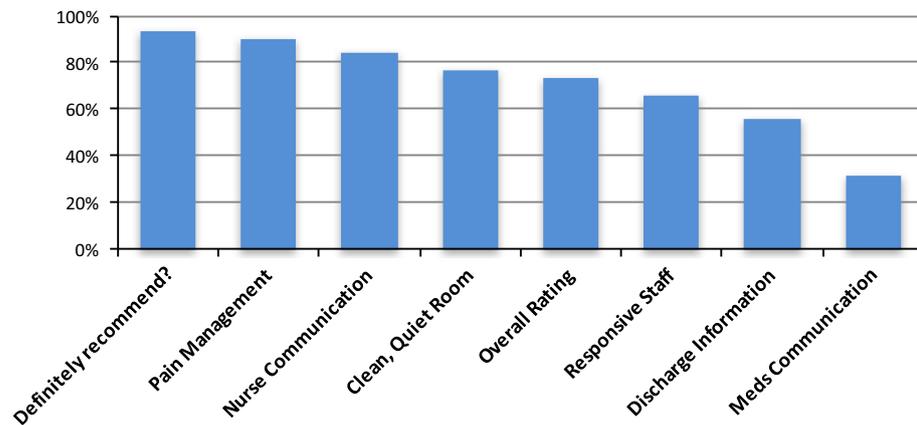
procedures included two elective and one emergent Cesarean section. Anesthesia procedures, from induction and maintenance through emergence, were carried out with the same level of reliability and consistency for all ten procedures. Emergent case type did not appear to cause any deviations from standard elective practices. There were no waste steps consistently identified, for either general surgery or obstetrical procedures. The team observed 100% adherence to the World Health Organization Surgical Safety Checklist, which is mandated by VRAH for all operative procedures.

Discussion

Survey data and perioperative observations over a 2-week study period demonstrate that the VRA Hospital maintains a strong culture of patient safety and quality of care. Over 80% of employees across a variety of perioperative roles held a positive view of teamwork and safety climate within the institution, suggesting that both frontline workers and hospital leadership regard the environment in a positive light. The surgical patients who were surveyed gave similarly positive indications of overall satisfaction, with 93% stating they would “definitely recommend” VRAH and over 70% reporting a maximal satisfaction score.

We found this positive regard for the institution’s safety- and quality-focused culture to be reflected in its perioperative processes and institutional practices. Process mapping was a useful tool by which to evaluate for variation from standard practices and for the identification of potential waste steps. Three independent reviewers failed to identify any consistent waste steps over 10 surgical procedures, and

Fig. 2 Percentage of patients who gave highest “Top-Box” rating by HCAHPS category



noted well-defined roles for all operative team members. Furthermore, a number of positive processes and behaviors known to be associated with patient safety were observed, including 100% adherence to the WHO checklist, closed-loop communication and flat hierarchies allowing all employees to raise issues related to patient safety without fear of reprisal. Further quality- and safety-focused initiatives at the hospital included hospital-wide Morbidity and Mortality conference, 360-degree employee evaluations and safety training for new employees and trainees focused on risk reduction, process improvement, fatigue management and communication.

Previous studies have demonstrated that hospital safety culture and measures of team communication are associated with improved medical and surgical outcomes [10, 18]. Haynes et al. [14] investigated changes in operating room safety climate after implementation of the WHO Surgical Safety Checklist at eight hospitals and found that improved perception of teamwork and safety as measured by the Safety Attitudes Questionnaire correlated with a reduction in the postoperative complication rate. Similarly, Fan et al. [19] found a significant association between ten dimensions of surgical unit safety culture and post-colectomy surgical site infection (SSI) rates. Strong teamwork, communication and overall perceptions of safety were strongly correlated with lower SSI rates, even after adjusting for surgical volume and preoperative fitness of patients. Patient satisfaction has likewise been associated with measures of high-quality care [20–24]. Tsai et al. [25], in their study of 2953 US hospitals, found patient satisfaction, as measured by the HCAHPS survey, to be independently associated with improved performance of processes of care, lower readmission and lower mortality rates for six surgical procedures.

We were unable to correlate measures of safety culture and patient satisfaction with clinical outcomes at VRAH as reliable outcome data were unavailable—a common challenge in LMICs. We therefore used process mapping to

evaluate perioperative processes and to assess the degree of practice variability in the perioperative period. In North America and the UK, process mapping has been used to identify sources of variation in management and areas of inefficiency in surgical care [26–28]. DiGirolamo et al. [29] studied the management of small bowel obstruction and used process mapping to identify patient flow in the emergency department and operating room capacity as key sources of inefficiency. Likewise, McLaughlin et al. [30] used process mapping in their institutional redesign of neurosurgical care to identify opportunities for care standardization. In our study, review of process maps for ten general surgery and obstetric procedures allowed for an objective assessment of variation in care and adherence to best practices. In resource-limited environments where reliable outcome data are limited, analysis of perioperative care through process maps might be a proxy measure by which to evaluate surgical quality and identify opportunities to improve care [5].

Our study adds to the literature on surgical quality and safety in LMICs by providing a multifaceted examination of one high-performing district hospital. We found consistency between assessments of safety climate, patient satisfaction and processes of care, suggesting that strong safety culture and attention to quality of care may translate into reliable perioperative practices. Furthermore, this observational study demonstrates that developing a culture that fosters behaviors and practices characteristic of a high-performing hospital is feasible in a low-resource setting without requiring significant financial resources. For example, behaviors such as adherence to surgical checklists, and fostering flat hierarchies may be achieved at little expense.

In addition to the many high-performance behaviors at VRAH, we also identified areas for improvement. First, employee surveys demonstrated low scores for stress recognition and working conditions, which could be addressed using WHO training materials for health care

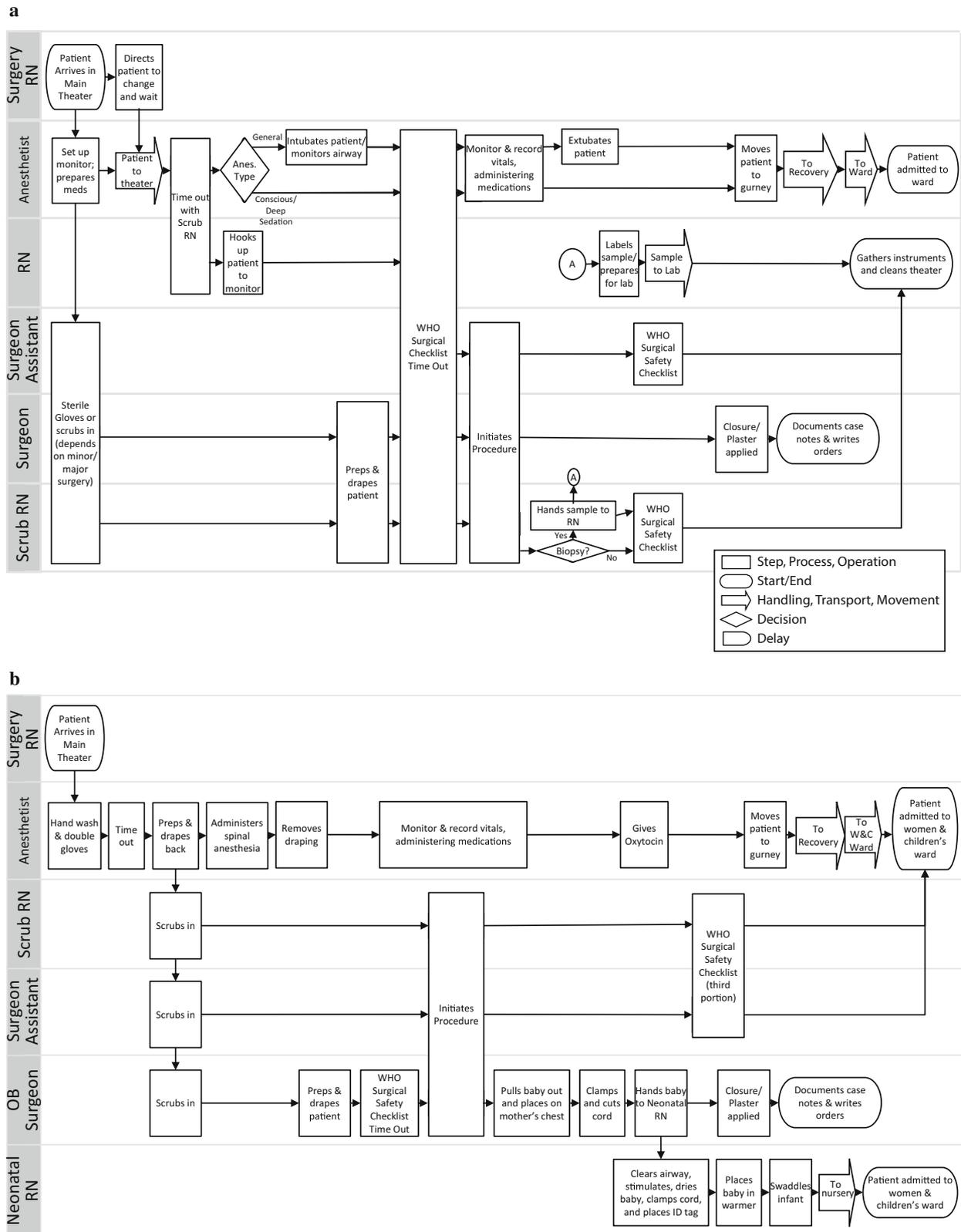


Fig. 3 a General surgery process map. b Obstetrics process map

workers in LMICs. Other issues highlighted by patients include a need for improved communication regarding medication and discharge planning. Finally, our study underscores the need to develop a reliable, low-cost system for measuring surgical outcomes at the district level hospital. Together, these goals might best be achieved through a formal quality improvement program directed at LMIC hospitals, including initiatives to strengthen safety culture, process improvement and outcomes data collection.

Limitations of our study include a small sample size with convenience sampling, a short observation period and the utilization of survey tools that are widely used but not validated for a West African setting. The SAQ has been used to assess safety culture in a variety of LMIC settings, making this a reasonable choice for our study [31–34]. VRAH is also a relatively low-volume institution, with a median annual admission volume of 3700 patients between 2012 and 2016, which limited both the depth and breadth of our survey assessment and observational data gathering. Despite this, our observations did capture multiple procedures by each of the four surgeons and the single core surgical team, lending strength to our assessments of team dynamics and perioperative practices. Finally, while the VRAH does track certain outcomes measures across the institution, it lacked reliable surgery-specific measures such as perioperative mortality or surgical site infection rates, which would have been necessary to associate measures of safety culture and patient satisfaction to outcomes.

Though surveys of employee safety climate and patient satisfaction correlated with perioperative process consistency and lack of waste steps, we are unable to determine whether this association is causal, or what the direction of causality might be. We suspect that a global culture of safety promotes adherence to best practices and consistent perioperative processes; but it is possible that the reverse is true, and vigilant adherence to high perioperative standards leads to improved communication, strong teamwork and positive perceptions of safety and quality [35]. Ultimately, it is important to demonstrate that a clinical environment with strong safety culture facilitates the delivery of high-quality surgical care, and reliable outcomes data will be necessary to definitively answer this question.

Conclusions

Perioperative observations at the VRA Hospital demonstrated consistently high standards of care and an institutional commitment to safety, with strong teamwork culture and patient communication. The VRAH demonstrates the feasibility of delivering high standards of perioperative care in a low-resource setting. Process mapping, in

particular, was found to be a useful tool that could be used to assess perioperative care and the degree of process variability. Further study should focus on improving our understanding of other similar high-performing institutions in low-resource settings, with the ultimate goal of creating inexpensive training interventions to support hospitals in their quest for continuous quality improvement.

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