Letters

RESEARCH LETTER

Mortality After Peritonitis in Sub-Saharan Africa: An Issue of Access to Care

There is a lack of access to emergency surgical care in developing countries despite a burden of surgical disease.[1] Health care systems are overwhelmed by the high volume of patients who need acute care and by insufficient capacity because of a lack of appropriate prehospital care, surgery-capable clinicians, and basic health care delivery infrastructures.[2] Compared with high-income countries where mortality from peritonitis is less than 5%, mortality in this resource-poor setting is nearly 20%.[1,3] These patients are particularly susceptible because of a lack of the prerequisite surgical infrastructure, which includes prompt triage and diagnosis, early transfer to a higher level of care, timely surgical intervention, and critical care services.[4] This study identifies outcomes of patients with peritonitis and factors that contribute to mortality.

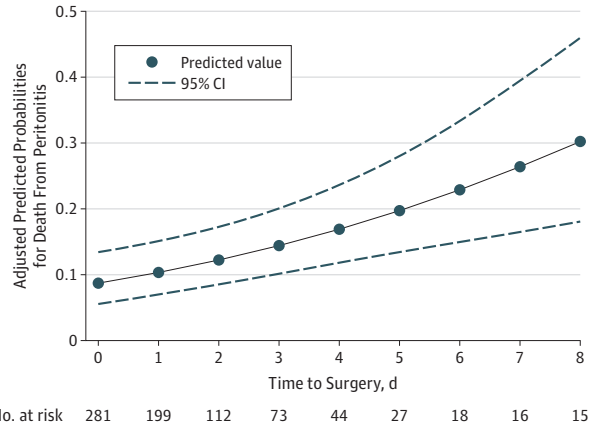
Methods | This is a prospective observational study of patients at Kamuzu Central Hospital in Lilongwe, Malawi, presenting with acute abdominal complaints from September 2013 through March 2016. The University of North Carolina institutional review board and the Malawi National Health Services review committee approved this study and waived con-

Table. Bivariate Analysis of Background and Admission Information on Patients Presenting With Acute Care Surgical Complaints by Presence of Peritonitis

Characteristic	Patients, No. (%)		*P* Value
	With Peritonitis (n = 374)	Without Perionitis (n = 1118)	
Age, mean (SD), y	33.1 (16.8)	36.6 (20.3)	.02
Female	123 (32.9)	328 (29.3)	.20
Lives in large urban area	147 (39.3)	434 (38.8)	.87
Time to presentation at first health care facility from initial symptoms, median (IQR), d	3.6 (2.0-7.4)	3.8 (1.5-12.9)	.27
Transferred from outside facility	324 (86.9)	912 (81.9)	.03
Time at outside health center, mean (SD), d	1.4 (2.2)	1.3 (4.6)	.83
Presenting AVPU score			
Unresponsive	17 (4.6)	15 (1.4)	<.001
Responds to pain	25 (6.7)	36 (3.3)	.003
Responds to voice	9 (2.4)	28 (2.5)	.92
Alert	320 (86.3)	1021 (92.8)	.001
Disposition from emergency department			
Admitted to ward	359 (96.0)	1104 (98.8)	.001
Admitted to ICU	9 (2.4)	8 (0.7)	.01
Death declared in casualty	6 (1.6)	6 (0.5)	.045
Patient had surgical intervention	324 (86.9)	912 (81.9)	.03
Time to operation from presentation at a health care facility, median (IQR), d	2.1 (3.7)	4.2 (9.3)	<.001
Common procedures for each cohort			
Appendectomy	89 (30.7)	12 (1.6)	<.001
Large bowel resection/repair	30 (10.3)	125 (16.7)	.01
Small bowel resection/repair	82 (28.3)	202 (27.0)	.69
Inguinal hernia repair	2 (0.7)	241 (32.3)	<.001
Most common postoperative diagnoses			
Gastrointestinal perforation	102 (35.2)	38 (5.1)	<.001
Acute appendicitis	89 (30.7)	12 (1.6)	<.001
Bowel obstruction	33 (11.4)	140 (18.7)	.004
Volvulus	16 (5.5)	171 (22.9)	<.001
Inguinal or epigastric hernia	4 (1.4)	270 (36.1)	<.001
Primary peritonitis	29 (10.0)	8 (1.1)	<.001
Other	16 (5.5)	104 (13.9)	<.001

Abbreviations: AVPU, Alert, Voice, Pain, Unresponsive; ICU, intensive care unit; IQR, interquartile range.

Figure. Association of Mortality and Time to Operation for Patients With Peritonitis



The predicted probability of death for patients with peritonitis is based on the number of days to their initial surgery from the time of presentation to a health care facility and is adjusted for age; a poor Alert, Voice, Pain, Unresponsive score; and a postoperative diagnosis of gastrointestinal perforation ($P < .001$).

sent because this study was not changing the standard of surgical care. We compared patients with and without peritonitis using the Pearson correlation for categorical variables and 2-sample *t* tests for continuous variables. We fit a modified Poisson model[5] to estimate the risk ratio for in-hospital mortality among patients with peritonitis and adjusted for confounders. Clinically relevant confounders were initially included and removed using a change-in-effect method. A multivariate modified Poisson model was used to examine predictors of mortality from peritonitis. All clinically relevant variables were initially included and reduced models were compared with a complete model using a likelihood ratio test. Adjusted risk ratios and adjusted predicted probabilities with 95% CIs are reported. The statistical significance of all *P* values was set at less than .05.

Results | A total of 1492 patients were enrolled in the study (mean [SD] age of 35.7 [19.5] years; 68% male). On presentation, 374 patients (25.1%) had peritonitis. There were differences in demographics, disease etiology, and surgical management between those with and those without peritonitis (**Table**).

Patients with peritonitis experienced a significant increase in crude in-hospital mortality compared with patients without peritonitis (18.2% vs 11.8%, respectively; $P = .002$). Characteristics associated with mortality included older patient age; being female; living in a rural environment; transferring from another facility; a poor Alert, Voice, Pain, Unresponsive score; and nonsurgical management. The risk ratio of in-hospital death for those with peritonitis compared with those without was 1.6 (95% CI, 1.1-2.1), adjusted for age, sex, surgical intervention, and a poor Alert, Voice, Pain, Unresponsive score.

Among those with peritonitis, time to operation from presentation (each day: risk ratio, 1.08 [95% CI, 1.05-1.10]; each 10-year increase in age: risk ratio, 1.29 [95% CI, 1.14-1.47]; a poor Alert, Voice, Pain, Unresponsive score: risk ratio, 2.03 [95% CI, 1.16-3.54]; and a postoperative diagnosis of gastrointestinal perforation: risk ratio, 2.26 [95% CI, 1.35-3.77]) significantly increased the risk of in-hospital death. The adjusted predicted probability of death increased significantly based on time to operation when controlling for these factors (**Figure**).

Discussion | Our study highlights critical points related to surgical access. First, patients with access to timely triage, such as those living in an urban environment, had a survival benefit. Second, not only is transfer from an outside facility associated with increased mortality, but for patients with peritonitis, each day from the time of initial presentation to their first operation increased the adjusted risk of death approximately 10%. Finally, at our tertiary center, a third of patients with peritonitis did not have access to surgical management because of limitations in surgery- and anesthesia-capable clinicians and operating room support staff.

The improvement of emergency surgical care should parallel efforts to expand national trauma systems in areas such as prehospital care, triage, and management. Increasing the surgical workforce at the secondary level of the health care system can lower transfer rates and increase the number of district-performed emergent procedures.[6] These system improvements, along with a prioritization of national expenditures in surgical care, would likely result in improved mortality.

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Consumer Preferences and Online Comparison Tools Used to Select a Surgeon

The public reporting of physician quality is mandated by the US federal government and made accessible through the website Physician Compare.[1] However, Physician Compare is only 1 of several online resources that provide physician ratings to consumers.[2] Despite the widespread availability of this information, little is known about how consumers use it to make decisions regarding health care, particularly when selecting a surgeon.

Methods | From March 1 to 31, 2016, we surveyed a sample of households that use the internet about their use of online ratings to select a surgeon for themselves or a family member. The survey was conducted electronically through Market Insights (National Research Corp). Briefly, a national sample plan is used to collect and weigh data by demographics to enhance sample representativeness of the US population. A total of 25 415 participants were surveyed (95.6% of the national survey quota of 26 578), resulting in a valid, weighted sample of 24 953 individuals. Multivariable logistic regression was used to determine the influence of consumer demographics on having searched for a surgeon online. $P < .05$ was considered significant. This study was approved by the Johns Hopkins School of Medicine Institutional Review Board, which waived the requirement for informed consent.

Results | Respondents were a mean age of 50 years, 15 822 were female (63.4%), and 18 525 were white (74.2%). A total of 17 468 respondents (70.0%) had at least 1 chronic health condition, with 5190 (20.8%) confirming recent or planned surgery.

Table 1 summarizes what factors respondents consider important when selecting a surgeon. Accepting a respondent's insurance was the most important factor (12 702 [50.9%]), followed by referral from a primary care physician (10 884 [43.6%]) and reputation of the physician (9489 [38.0%]). Respondents searched online less often for a physician (5273 [21.1%]) or surgeon (1853 [7.4%]) than they did for a restaurant (12 420 [49.8%]). An income greater than $50 000 (odds ratio [OR], 1.26; 95% CI, 1.12-1.42; $P < .001$), having health insurance (OR, 1.44; 95% CI, 1.26-1.65; $P < .001$), and recent or planned surgery (OR, 3.46; 95% CI, 3.13-3.83; $P < .001$) increased the likelihood of searching for a surgeon online, while older age (OR, 0.72; 95% CI, 0.65-0.80; $P < .001$), education less than a college degree (OR, 0.84; 95% CI, 0.76-0.93; $P = .001$), and unemployment (OR, 0.88; 95% CI, 0.78-0.98; $P = .03$) decreased the likelihood of searching for a surgeon online. **Table 2** outlines respondents' use of physician comparison websites. The site used most frequently was Yelp.com (3049 [12.2%]), followed by Healthgrades.com (2475 [9.9%]) and the website for a health care system, hospital, or group practice (1844 [7.4%]). Most respondents (17 086 [68.5%]) had never used a health care comparison website, but if they did use such a site, it was to learn more about a physician or hospital (6925 [27.8%]) rather than to post a comment (1539 [6.2%]).

Respondents indicated that an ideal surgeon comparison website would include information about years in practice (13 896 [55.7%]), insurance accepted (13 733 [55.0%]), educational level (12 288 [49.2%]), and patient comments (10 913 [43.7%]). Less important was a ranking relative to peers (8896 [35.7%]), surgical volume (8777 [35.2%]), information on legal issues (8531 [34.2%]), and rates of complications (7179 [28.8%]). To display this information, respondents would trust an advocacy or professional group (4715 [18.9%]) as compared with a ratings company (2422 [9.7%]).

Table 1. Respondents' Ranking of Preferences for Selecting a Surgeon

Preference	Response, No. (%)[a]
Accepts my insurance	12 702 (50.9)
Referral from primary care physician	10 884 (43.6)
Physician reputation	9489 (38.0)
Hospital reputation	6972 (27.9)
Office location	4321 (17.3)
Recommendation from family or friend	2431 (9.7)
Rating website	1675 (6.7)
None	2928 (11.7)

[a] N = 24 953. Multiple responses possible, may not sum to 100%.

Table 2. Respondents' Use of Common Organizations Rating Health Care Online

Organization or Website	Response, No. (%)[a]
Yelp.com	3049 (12.2)
Healthgrades.com	2475 (9.9)
Health care system, hospital, or group practice	1844 (7.4)
Insurance plan	1798 (7.2)
Angie's List	1367 (5.5)
Consumer Reports Doctors and Hospitals	1320 (5.5)
US News and World Report	1182 (4.7)
Medicare.gov Physician Compare	1037 (4.2)
Vitals.com	787 (3.2)
Ratemds.com	446 (1.3)
Consumers' Checkbook Surgeonratings.com	272 (1.1)
Ucomparehealth.com	250 (1.0)
ProPublica Surgeon Scorecard	157 (0.6)
None	16 860 (67.6)

[a] N = 24 953. Multiple responses possible, may not sum to 100%.