Surgical need & capacity in low and middle income countries
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Chapter 1

Pilot testing of a population-based surgical survey tool in Sierra Leone.

Abstract

**Background** The prevalence of surgical diseases in low income countries is thought to be very high, but to date no population-based survey has documented the need for their care. The Surgeons OverSeas Assessment of Surgical Need (SOSAS) is a survey tool programmed for use with iPads to measure the prevalence of surgical conditions.

**Methods** To assess the appropriateness and utility of SOSAS, a pilot test was undertaken in Sierra Leone. Local medical students were trained in sampling, interviewing, and SOSAS specifics. Five clusters of 10 households were randomly selected and 100 individuals were interviewed. Problems with the tool, iPad use, and respondent answers were collected. Daily debriefings with the enumerators aimed to identify problems and ways for improvement.

**Results** Administering SOSAS via iPads was found to be easy and facilitated data entry. Quick analysis of the data allowed for rapid feedback. Although the survey has 450 possible data entry points, by using conditional formatting, the enumerators were able to collect household demographics and interview two randomly selected household members in an average of 25 min. The survey methodology was acceptable, with a response rate of 96%. Five major sections were amended after the pilot.

**Discussion** Pilot testing of SOSAS showed that a population-based survey measuring the prevalence of surgical disease could be undertaken in a low income country. It is recommended that SOSAS be used with a larger sample size to calculate the prevalence of surgical disease in low income countries.
Pilot testing of SOSAS

Pilot Testing of a Population-based Surgical Survey Tool in Sierra Leone

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Chapter 1

Introduction

The prevalence of surgical conditions in low and middle income countries (LMICs) is thought to be very large [1, 2]; however, no formal studies have documented the presumed unmet need.

To document this unmet need, Surgeons OverSeas (SOS) developed the Surgeons OverSeas Assessment of Surgical Need (SOSAS). The draft of SOSAS was initiated by combining elements of the World Health Organization guidelines for conducting community surveys on injuries and violence [3], demographic health surveys [4], and a survey on road traffic incidents developed by Mock et al. [5] with additional items on maternal, congenital, neoplastic, and infectious surgically treatable conditions. An initial version was then completed via consensus agreement among 46 members of the SOS Research Group, and validation was initiated with cognitive interviewing in the United States with recent African immigrants, and by pretesting the tool with five individuals in the Netherlands and four individuals in Sierra Leone. The tool was programmed with FileMaker Pro for data entry through iPads.

In order to plan for a countrywide survey to accurately assess the prevalence of surgical conditions with a large sample size, it was first decided to pilot test the survey. Given the long-standing relationship between SOS and surgeons at Connaught Hospital and the Ministry of Health and Sanitation (MOH&S) in Sierra Leone [6, 7], a decision was made to execute the pilot testing in and around Freetown, the capital. Sierra Leone is a small West African Country with a documented lack of surgical capacity [8] where it is expected to have a huge backlog of untreated surgical conditions.

Methods

In Sierra Leone, two medical students (one male, one female) from the Sierra Leone College of Medicine and Allied Health Sciences (COMAHS) were recruited and underwent 3 days of training in questionnaire content, interview techniques, sampling strategies, and iPad use. Translational aspects of the survey were discussed in detail with an experienced enumerator from Statistics Sierra Leone (SSL), the official national statistics bureau. As there are multiple languages in Sierra Leone, a decision was made to keep the survey in English and have the medical students translate into Krio, the lingua franca of Sierra Leone, or if needed find a local translator.

Prior to execution, Institutional Review Board (IRB) approval for the pilot was obtained from the University of Virginia medical Human Subjects Committee, with additional approval from the Directorate of Training, Non-Communicable Diseases, and Research of MOH&S of Sierra Leone.

Ten households in five different clusters were randomly selected in the Freetown area. The enumerators then approached household representatives to collect household demographic data and information on household member deaths. Subsequently two household members were randomly selected and interviewed. The interview consisted of questions to the household representative about the number of persons living in the household (household denominator), household means for transportation to health facilities, and household deaths in the previous 12 months. The interviews for the two randomly selected individuals of the household consisted of general health questions followed by detailed questions about surgical conditions covering distinct body sections: head/face and neck, chest and breast, back, abdomen, groin, and—lastly—extremities. For the females, detailed questions about their menstrual cycle were included.

All the questions for the different body sections were standardized. The first question asked was if there was any problem in the designated anatomical area. If there was, specific questions were asked regarding the problem. The answer options were standardized like: wounds, masses, deformities, or other issues, depending on the anatomical location. This series of questions was followed by specific questions about the cause of the problem, whether the problem was still present, and whether treatment had been sought and received. If no surgical care was obtained for a specific problem, a follow-up question was asked regarding reasons why not. The last question of each section was whether the condition was disabling. All questions in the survey were categorized, and to facilitate data processing, no open-ended questions were asked.

The iPad programming included automatic timestamps for analyzing the time the interviewers needed to complete each interview. The enumerators kept notes regarding the response rate of the people being questioned; they also noted whether individuals were not present at the time of the survey and needed to be revisited. Informed consent was obtained from all interviewees.

Daily debriefings were conducted with the two enumerators in an effort to identify problems and to assess the quality of the data collected. To better understand the administration of the survey questions, the logistics of choosing households, and ways of identifying possible problems with the survey, one author (R.G.) spent one day with the enumerators and collected data on eight households and the randomly selected individuals for interview.

Data were downloaded daily and analyzed. Enumerators were provided with immediate feedback, and issues with the questions or the survey were recorded.
Results

The pilot testing of SOSAS was easily completed over 3 days. Of the 100 attempted interviews, 96 individuals agreed to complete the survey, for a response rate of 96%. Of the 50 households visited, 10 required revisiting because individuals selected for interview were not present at the time of the initial visit. One household was replaced because a household representative was not available. Of the four individuals who were not interviewed, three were not present after interviewers attempted to revisit the household, and one refused to participate. Household sizes ranged from 2 to 25 members, which immediately prompted the need to increase the number of data positions for the household denominator from the initial 20 to 30.

Analysis of the time stamp data showed that, on average, household data were collected in 11 min (range: 3–28 min) and that the individual data could be collected in 7 min (range: 2–15 min). This results in an average household visit of 25 min, which included the time for interviewing both the household representative and the two randomly selected household members. The range in the time needed for an interview was closely linked to the total number of household members and the number of surgical treatable conditions reported by the respondent.

The two enumerators expressed confidence that 3 days of training was sufficient for them to administer the survey and use the iPad. 3 days was also sufficient to undertake the pilot; however, help with the survey was provided on one day by one of the authors (R.G.).

The data were downloaded each evening from the iPads into an Excel spreadsheet (Microsoft, Redmond, WA) for later analysis. A quick analysis using the limited sample size identified 14 (14.6%) respondents as reporting a surgically treatable condition; however, seven of those identified reported also that they did not have a need for surgical care (e.g., the condition was minor or not bothering the person, or after a hospital consultation an operation was not deemed necessary). The other 7 (7.3%) respondents were thought to be in need of a consultation and possibly an intervention. Of the 7 respondents who had a condition that would need surgical attention, 4 had a swelling/mass in the groin/genitalia area; 2 had a wound (one in the face/head/neck area one on the lower leg), and one had a burn in the groin/genitalia area. These conditions could represent hernias, wounds, or cancer.

Nine households (18%) reported a death of a household member in the previous 12 months and two (22%) of these deaths may have been prevented with surgical intervention: a 22-year-old man who died en route to a hospital after a road traffic injury and a 54-year-old male with suspicion of an esophageal malignancy.

Based on the debriefings of the enumerators and issues with the survey, five major changes were made to the questionnaire: (1) more data-entry possibilities for the household denominator were added; (2) the questions for means of transportation were revised to include questions on transport waiting time, available means of transportation, and the amount of money needed; (3) a free response space was added to record specific information about the (surgical) household deaths to aid in the assessment of the classification of the cause of death; (4) the questions about timing of the surgical problem were adapted to allow calculation of acute and chronic conditions separately; and (5) for the anatomical location classified as face/head/neck, subdivisions of eye, ear/nose/throat, dental/lips/mouth, neck and head were added.

A final version of SOSAS in .pdf format reflecting the changes made after the pilot testing is available on the resources page of the SOS website at: www.surgeonsoverseas.org. Other versions in .doc or .fmp format are available from the corresponding author.

Discussion

The pilot testing of SOSAS was successfully completed in Sierra Leone and showed that a population-based survey documenting the prevalence of surgical conditions in a developing country could be undertaken. The survey methodology, use of iPads, using medical students as enumerators, and logistics were successful, but it must be stressed that assistance of local colleagues from Connaught Hospital, the MOH&S, and SSL was essential.

The 3 days of training was adequate to familiarize the enumerators with the survey questions and with the iPad, but it was recognized that having medical personnel undertake such a survey is an important point to consider. Although there was no physical exam component to the survey, using medical students was helpful in the categorization of the answers. Of note, though, there was a steep learning curve once enumerators began data collection in the field and possibly a longer training time would be warranted, especially if a larger group is going to be trained.

The use of computers in face-to-face interviews, known as computer-assisted personal interviewing (CAPI) is well established, but the use of the iPad as a CAPI tool in a non-Western setting has not often been attempted [9]. The use of the iPad was very helpful in conducting the interviews in that they visually simulated paper forms and were lightweight and easy to handle, especially when it was necessary to skip a section of the survey or to return to a question to add additional relevant information that the respondent remembered later in the interview. Data entry problems...
decreased as the students were exposed to more interviews, but accuracy was also enhanced by the conditional formatting, which automatically skipped questions that became irrelevant due to earlier answers. The enumerators also reported that the high-tech method of data collection did not appear to cause difficulty or unease on the part of respondents, either in the urban or rural clusters.

Data confidentiality was secured by the use of automatic locks and PIN numbers known only to the enumerators. In the case of loss or theft of the device, an application “Find My iPad” was installed on each iPad that would allow for remote tracking and even remote deletion of any data. It is for this reason that the 3G version of the iPad is recommended, in which a local SIM card can be inserted and the local telephone network can be used.

The timestamps in the programmed survey helped in calculating the approximate time needed to conduct the interviews and will be helpful in planning full country surveys. It is important to recognize, though, that although household surveys resulted in an average of 25 min per household, additional time was spent in initial greetings, introductions, and explanations to village leaders, as well as identification of the household representatives before entering the household and starting the formal consent. It was only after consent was obtained that the timing of the interview was initiated. It was also felt that timestamps would be useful in detecting fraud if data were entered too rapidly, which was not an issue during the pilot testing. iPad use also facilitated data analysis, which allowed for almost instantaneous feedback.

Drawbacks of the use of the iPad must also be considered. Their initial cost is high, and there was a significant investment of time for programming. However these investments are partially returned by not having to print surveys and not needing to spend resources and time for data entry. The battery life was found to be sufficient for two full interview days, which was fine for the interviewing in and around Freetown, but backup was needed when visiting remote locations.

The surgical conditions identified by SOSAS do not provide a definitive diagnosis but rather descriptions of probable surgical problems identified by non-medical populations in urban and rural settings in Sierra Leone. Although definitive diagnoses cannot be made, the survey results do indicate at a minimum the need for a surgical consultation, and they probably underestimate the unmet need for surgery due to a lack of screening for cancer.

It was recognized that having SOSAS validated with a physical exam component would strengthen the tool; however, this step will require a more intrusive study which will require better educated medical personnel. Furthermore such a validation study will require different logistics and appropriate ethical approvals and informed consent.

Conclusions

The SOSAS pilot testing was successfully conducted in Sierra Leone and showed that a population-based survey could be accomplished in a LMIC setting. Data from the pilot helped to make SOSAS a stronger tool. The use of the iPad was found to be useful in the data collection and handling and was easily learned by local enumerators. It is hoped that full country surveys will be conducted using the SOSAS tool to measure the prevalence of surgical conditions.

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Conflict of interest None of the authors is funded for their contributions. Surgeons OverSeas (SOS) assisted the logistics and payment of enumerators and transportation with funding from private contributions. MOHS contributed with local transportation and administrative assistance.

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