Development of an evidence-based curriculum for training of ward-based surgical care

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**Abstract**

**BACKGROUND:** Ward-based care of surgical patients is a complex and variable process, centered on the surgical ward round (WR). The authors describe the development of an evidence-based curriculum to improve ward-based care in the form of surgical WRs.

**METHODS:** A modular, simulation-based curriculum was developed according to validated methods, incorporating the most recent evidence in the design of each educational module.

**RESULTS:** A predevelopmental analysis questionnaire identified themes of patient assessment and management, communication skills, and teamwork as areas to be addressed. Curricular development incorporated knowledge and confidence assessment, lecture-based teaching, and simulated WR, followed by individualized assessment, debriefing, and feedback. Each module is evidence based and assesses trainees using validated tools.

**CONCLUSIONS:** A comprehensive and cost-effective simulation-based curriculum, developed according to a validated framework, has been developed for surgical WRs and ward-based care. This may improve trainees’ WR performance, improving patient care and surgical outcomes in turn.

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The provision of high-quality ward-based care plays a crucial role in the surgical inpatient pathway.\textsuperscript{1} Traditionally, the primary means through which ward-based care is delivered is the surgical ward round (WR), a complex task during which a multitude of clinical processes are undertaken, including the progression of care, refinement of diagnoses, prescription and management of treatment, and discharge planning.\textsuperscript{1} With postoperative morbidity rates as high as 30\% to 50\% for some complex procedures,\textsuperscript{2} the importance of thorough patient assessment and appropriate management during the surgical WR is clear. Despite this, published evidence suggests a significant amount of variability in ward-based care currently exists; work by Ghaferi et al.\textsuperscript{3,4} for example, demonstrated a significant (almost doubled) increased risk for mortality between centers despite equal risk-adjusted rates of postoperative morbidity. Such figures appear to suggest that varying (short-term) surgical outcomes and rates of mortality are, in large part, due to failures in postoperative care. Although some studies...
have identified structural factors such as hospital size and nurse staffing ratios, this has accounted for only a small portion of variability, suggesting that process factors such as WRs play a greater role still.5,6

Currently, trainees conducting WRs rely primarily on the Halstedian method of “learning by doing” for this task.1 This outdated method raises a number of issues. First, the use of unwell patients to teach complex case management presents potential ethical questions. Furthermore, from a practical perspective, opportunities for apprenticeship-style learning have been greatly reduced with the now widespread introduction of statutory limitations on working hours, such as in North America7 and Europe,8 highlighting the need for modern training alternatives. Finally, such an approach does not serve to address the complex demands of leading a WR, which extend beyond learning the basic skills of patient assessment and management, to critical non-technical skills such as teaching, leadership, and multiprofessional communication.9 The lack of trainees’ graded progression, leading to assured proficiency, potentially exposes patients to undue risk for mismanagement with dire consequences.

To improve the quality of WRs, the formalized means for standardization of practice, training, and assessment must be considered. Current surgical curricula have begun to recognize the importance of WRs and non-technical skills in general, with the ACS/APDS Skills Curriculum identifying team-based skills as 1 of its 3 primary modules. Similarly, the Intercollegiate Surgical Curriculum Programme in the United Kingdom singles out WRs as a curricular requirement.10 However, neither provides recommendations on how skills such as the conduct of surgical WRs are to be acquired. In the present context of the known variability of ward-based care, there is a clear need for the development of an evidence-based, comprehensive curriculum to address this training gap.

The purpose of a curriculum is to confer knowledge and skill, through ongoing feedback and assessment with progression toward a predetermined level of proficiency.11 Simulation has proved itself as an effective means of achieving this and has been widely incorporated in surgical technical skills training,12 with increasing use for non-technical skills too.13 The development of simulation for ward-based skills is a relatively recent concept and presents the advantages of a high-fidelity, controlled environment in which reproducible assessment and training scenarios can be created, without risks to patients or clinical staff members.14 To allow the implementation of appropriate, evidence-based training for WRs in this context, the aim of this study was to develop a comprehensive simulation-based curriculum for WR training on the basis of modern training methods and best published evidence.

Methods

Curricular design proceeded according to validated methodology11 and incorporated the recommendations of a recent expert consensus framework for the creation of simulation-based surgical curricula.15 Broadly, these identify a 3-step process, consisting of predevelopment analysis, curricular development, and curricular validation. Predevelopment analysis incorporates a needs and resource assessment, optimizing prerequisites to enable implementation of the curriculum. The curricular development stage advocates deconstruction of the procedure into component tasks and individual domains of cognitive, psychomotor, and team-based aspects of skill. Delivery and validation of the curriculum mandates the selection of appropriate simulation models for training, skill-based tutorials, validated assessment, and debriefing tools.

Predevelopment analysis

Appropriate space and resources in which to implement a ward simulation–based training program were identified according to published recommendations.14 As part of a predevelopmental analysis, an open questionnaire was circulated to general surgical trainees who had participated in a previous ward simulation pilot study and therefore had demonstrated stakeholder interest in the area. They were asked to name the most important factors they felt were responsible for determining the quality of a WR, thereby identifying quality markers and desired points for improvement that might be addressed. Questionnaire responses were transcribed into a blinded database (Excel; Microsoft Corporation, Redmond, WA) and were subjected to analysis of emergent themes. The resulting topics were combined with information derived from existing surgical curricula to derive cognitive, team-based, and psychomotor learning objectives.

Curricular design

A modular tutorial design was adopted to address learning goals identified in the predevelopment analysis. A review of published literature was undertaken in each case to identify suitable, validated training and assessment tools.

Results

Predevelopment analysis

The questionnaire was issued to 20 general surgical trainees (ST3–ST8 specialist registrars, equivalent to postgraduate year 5 to 12 residents); 18 responses were received. Emergent theme analysis of the free-text answers given identified 8 factors trainees deemed to be important determinants of WR performance (Table 1), including staff-related issues (67%), documentation (56%), and time management (56%). Saturation of themes, the point at which no further new themes were identified, was reached within the number of questionnaire responses. After review of the
available literature, published guidance,9 and existing curriculums,10,16 these factors were condensed into 3 themes: patient assessment and management, communication skills, and teamwork. Broadly mirroring the 3 prescribed domains of cognitive, psychomotor, and team-based skills, these formed the basis for further curricular development.15

Curricular development

To better allow integration with existing training curricula, the WR curriculum is structured as a half-day training course (Fig. 1). This consists of: (1) a assessment of knowledge and confidence; (2) a didactic session; (3) simulated WR and performance assessment; and (4) debriefing and feedback. After a literature search, peer-reviewed, validated methodology was used in the design of each module (Table 2).

Knowledge and confidence. Trainees are asked to respond to a series of statements on a standard Likert-type scale on a pretest and posttest questionnaire, based on a validated design.17 The questionnaire is designed to evaluate trainee knowledge, confidence and attitudes in the independent conduct of surgical WRs.

Didactic session. The didactic session focuses on generic skills for surgical WRs and published recommendations for WR structure.9 The session encourages trainee discussion of their own experiences in conduct and to conduct WRs, to better relate learning point to trainees’ current practice. Describing current up-to-date published evidence, the session emphasizes a systematic approach to patients with conscious consideration of nontechnical and team-based skills (Fig. 2).

Simulated ward round. WR performance is observed in a high-fidelity simulated ward, with trainees performing a WR of 3 simulated patient scenarios, played by trained medical actors. These standardized scenarios, previously validated,18 reflect commonly presenting surgical pathologies such pancreatitis, appendicitis, or colectomy, whose appropriate management could reasonably be expected of junior surgical trainees.10 Each scenario is based on a real patient, with the trainee required to devise an appropriate management plan during the WR, following thorough patient assessment, appropriate decision making, and inclusion of the multidisciplinary team consisting of an intern and staff nurse (both course confederates). Conduct of the simulated WR is recorded using unobtrusive ceiling-mounted digital video cameras (smots; Scotia UK plc, Edinburgh, UK).

Assessment tools. The WR is assessed using the Surgical Ward Care Assessment Tool18 for psychomotor aspects of the WR, involving patient assessment and management. For nontechnical skills such as teamwork, communication, and leadership, multiple validated scales exist: the Non-Technical Skills Scale, Objective Teamwork Assessment for Surgery, and Non-Technical Skills for Surgeons.19 Of these, the Non-Technical Skills Scale has been adapted to

<table>
<thead>
<tr>
<th>Theme</th>
<th>Example</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staffing</td>
<td>Presence of staff and fulfillment of team role</td>
<td>67</td>
</tr>
<tr>
<td>Documentation</td>
<td>Appropriate documentation in medical notes</td>
<td>56</td>
</tr>
<tr>
<td>Time management</td>
<td>Efficient use of time to see patient and chase results of investigations</td>
<td>56</td>
</tr>
<tr>
<td>Communication at handover/debriefing</td>
<td>Accurate handover and communication between teams</td>
<td>50</td>
</tr>
<tr>
<td>Systematic approach</td>
<td>Thorough patient assessment in systematic manner</td>
<td>22</td>
</tr>
<tr>
<td>Team approach</td>
<td>Teamwork and good leadership</td>
<td>22</td>
</tr>
<tr>
<td>Workload</td>
<td>Managing workload and number of patients under clinician’s care</td>
<td>11</td>
</tr>
<tr>
<td>Patient location</td>
<td>Efficiency of ward round when visiting patients on outlier wards</td>
<td>11</td>
</tr>
</tbody>
</table>

Figure 1 Curriculum flowchart with projected course time frame.

<table>
<thead>
<tr>
<th>Step</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-test knowledge and confidence assessment</td>
<td>30 min</td>
</tr>
<tr>
<td>Didactic session</td>
<td>90 min</td>
</tr>
<tr>
<td>Simulated WR</td>
<td>30-45 min</td>
</tr>
<tr>
<td>Debriefing and feedback</td>
<td>60 min</td>
</tr>
<tr>
<td>Post-test knowledge and confidence assessment</td>
<td>30 min</td>
</tr>
</tbody>
</table>
multiple clinical environments\textsuperscript{20} and is the only to have been validated in a version adapted specifically for WRs\textsuperscript{18}; it further benefits from its simplicity and its usability by minimally trained assessors.

**Debriefing and feedback.** After WR assessment, both summative and formative feedback is given. On the basis of principles outlined by Arora et al.,\textsuperscript{21,22} trainees receive specific feedback about performance on the basis of the assessment tools as described, as well as specific clinical information detailing their management of individual cases. Additionally, video of trainees’ WRs is reviewed for self-led and expert-led feedback.\textsuperscript{23} At course end, each trainee is again assessed for confidence and knowledge with the same questionnaire.

**Cost of curriculum.** Some initial expenditure is required for the design and development of simulated patient scenarios. For the scenarios designed in this pilot curriculum, this required the acquisition of medical stationary for the patients’ paper records as well as medical devices such as intravenous catheters, urinary catheters, intravenous fluids, and wound dressings, all of which were reusable. These initial costs were estimated at £100 (approximately $160).

Running costs of this curriculum are limited to the cost of medical actors to play patient roles, at £50 (approximately $80) per trainee, on the basis of a 3-patient WR for a standard 4-hour half-day course for 6 trainees. This does not include any potential fees for faculty members, rooms, or equipment rental, which are already in place in our institution, a level 1, certified, American College of Surgeons–accredited educational institution.

**Comments**

Despite increasing calls for the improvement of postoperative surgical care,\textsuperscript{9,24} as well as mounting evidence suggesting a lack of standardization in this domain,\textsuperscript{3,4} recommendations on how to address this have been lacking. To address an identified training gap, any curriculum must be based on valid, evidence-based measures to be credible\textsuperscript{15} and integrate with existing training schemes and resources to be implementable. As such, necessary evidence and tools to build a curriculum for surgical WRs have only recently been developed and are assembled here for the first time.

In this report, we present a curriculum for the training and assessment of surgical ward-based care (ie, surgical WRs). Designed according to a validated framework and incorporating evidence-based principles across each stage of development, it provides a comprehensive, robust and affordable approach to training for ward-based surgical care. It represents a multimodal approach to training, involving traditional didactic sessions, high-fidelity simulation, structured feedback, and debriefing. This is combined with assessment strategies designed to quantify the performance of each of the many skills required to demonstrate proficiency in the multifaceted skill of conducting a surgical WR.

**Table 2** Evidence-based module design

<table>
<thead>
<tr>
<th>Skill or module</th>
<th>Tool used</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge and confidence</td>
<td>Likert-type scale questionnaire based on published model\textsuperscript{17}</td>
<td>Examines trainee’s previous experience, current perceived skills, and attitudes toward ward round</td>
</tr>
<tr>
<td>Management and assessment of patient</td>
<td>Surgical Ward Care Assessment Tool\textsuperscript{18}</td>
<td>Validated tool gives score based on thoroughness of patient assessment</td>
</tr>
<tr>
<td>Team-based and nontechnical skills</td>
<td>W-NOTECHS\textsuperscript{18,20}</td>
<td>Validated tool, scores nontechnical behavioral domains</td>
</tr>
<tr>
<td>Clinical decision making</td>
<td>Compare actual to expected management for specific patient</td>
<td>Each scenario validated with surgical experts for expected (gold standard) treatment</td>
</tr>
<tr>
<td>Debriefing and feedback</td>
<td>Objective Structured Assessment of Debriefing\textsuperscript{21,22}</td>
<td>Structured approach to debriefing optimizing learner engagement and benefit</td>
</tr>
</tbody>
</table>

**Figure 2** A systematic approach to conduct of surgical WRs.
Structured as a half-day course, this curriculum is designed to integrate easily into existing surgical curricula. At a cost of £66 (about $110) per trainee (which includes actor hire but not any potential faculty fees), it is not subject to one of the often-cited drawbacks of simulation curricula, cost. Minimal capital expenditure to set up a ward simulator, or avoidance of such costs in using in situ simulation, means that it is potentially much more affordable than many other comparable simulation-based training programs for technical skills training.

Although this curriculum was based on design for a single half-day course, full implementation with multiple interval training sessions would be desirable to assess and maintain proficiency, learner retention, and feedback. Further courses could be tailored to encourage trainee progression with introduction of progressively more difficult or complex cases, with certification of proficiency at appropriately benchmarked levels of performance.\(^{11}\)

Improved WR performance should result in improved assessment of the patient, as well as management by a multidisciplinary team of health professionals. Through better or earlier detection of complications or unwell patients, appropriate management can be implemented earlier with improved surgical outcomes. Further research will seek to assess the implementation of the curriculum with trainee assessment before and after implementation, as well as transfer of skills into the clinical environment.

References

2. Ghaferi AA, Birkmeyer JD, Dimick JB. Hospital volume and failure to rescue with high-risk surgery. Med Care 2011;49:1076–81.