

Impact of orthopedic trauma consolidation on resident education

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Background: In July 2005, the Saskatoon Health Region, in conjunction with its orthopedic surgeons, consolidated its management of orthopedic emergencies from 3 sites to 1, resulting in trauma patients being directed to the university hospital site (Royal University Hospital; RUH) where orthopedic residents were the first responders. We sought to measure resident workload in the emergency department, operating room and ward before and after consolidation and to measure the perceptions of residents and faculty on the newly established orthopedic trauma service.

Methods: We compared orthopedic volumes at RUH in the emergency department (ED) and trauma-related operating rooms over 2 periods of 3 months' duration before and after trauma consolidation. We developed and disseminated questionnaires evaluating issues relating to patient care; resident education, including all CanMEDS domains; resident well-being; and the orthopedic trauma service to all orthopedic residents and faculty members.

Results: The number of patients seen by orthopedic residents in the ED increased by 67%, the number admitted through the ED to the ward increased by 66%, and the total number of inpatients and consultations increased by 43% after the consolidation. The number of patients processed through the orthopedic emergency operating room increased by 90%. In general, response to the change was positive and appreciated by residents and faculty members.

Conclusion: Sudden substantial increases in the volume of patients seen by orthopedic residents may not prompt negative resident responses when the overall gains offset, if not exceed, the perceived losses.

Contexte : En juillet 2005, en accord avec ses chirurgiens orthopédistes, la région sanitaire de Saskatoon a regroupé la prise en charge des urgences orthopédiques dans 1 seul centre plutôt que dans 3. Les polytraumatisés étaient donc tous orientés vers l'hôpital universitaire (RUH), où les résidents en orthopédie étaient les premiers intervenants. Nous avons voulu mesurer la charge de travail des résidents au service d'urgence, au bloc opératoire et à l'unité de soins avant et après la centralisation et évaluer les perceptions des résidents et du corps professoral vis-à-vis du nouveau service de traumatologie orthopédique unifié.

Méthodes : Nous avons comparé le volume de cas d'orthopédie traités au service d'urgence (SU) et dans les blocs opératoires de traumatologie du RUH au cours de 2 périodes de 3 mois précédant et suivant la centralisation de la traumatologie. Nous avons conçu un questionnaire que nous avons distribué à tous les résidents et membres du corps professoral afin d'évaluer les problèmes relatifs aux soins aux patients, à la formation des résidents, y compris toutes les compétences CanMEDS, au bien-être de ces derniers et au service de traumatologie orthopédique.

Résultats : Après le regroupement, le nombre de patients vus par les résidents en orthopédie au SU a augmenté de 67 %, le nombre d'admissions à l'unité de soins en provenance du SU, de 66 %, et le nombre total d'hospitalisations et de consultations, de 43 %. Le nombre de patients qui sont passés par le bloc opératoire orthopédique de l'urgence a augmenté de 90 %. Cette transformation a reçu un accueil généralement favorable des résidents et du corps professoral qui ont dit l'apprécier.

Conclusion : Une augmentation substantielle et subite du volume de patients que voient les résidents en orthopédie pourrait ne pas susciter de réponse négative de leur part lorsque les avantages globaux compensent, sinon excèdent, les inconvénients perçus.

In July 2005, the Saskatoon Health Region consolidated its management of orthopedic emergencies from 3 sites to 1. This decision redirected trauma patients from the 2 community hospitals into the Royal University Hospital (RUH), where orthopedic residents were the first responders.

Prior to this change, all 3 hospitals participated in the management of orthopedic emergencies; 1 of 10 community surgeons was on call for the 2 community hospitals, and 1 of 6 university-based surgeons was on-call for the RUH. Orthopedic residents covered the emergency department (ED) at RUH and played no role in the community on-call system. Children's emergencies were exclusively treated at RUH, and an effort was made to treat children's fractures before managing the adults. From an educational perspective, there was no formal clinical or educational trauma rotation at RUH. On-call orthopedic residents were obliged to interrupt their regular educational activities to attend to patients in the ED or on the ward or to attend consultations. Most patients had surgery at night or on weekends in competition with other surgical services. As a result, patients at RUH often waited days before their surgeries, whereas in the community hospitals patients were often added to the operative list and had surgery at the end of the day, resulting in shorter delays. Residents' on-call commitments changed daily, as did those of the faculty, resulting in a perception of disjointed communication and discontinuity of patient care.

After the initial consolidation, an 8-hour orthopedic trauma room, Monday through Saturday, was established. For the first 6 months after the transition, the expanded faculty at RUH ($n = 15$) were on-call for 24-hour rotations. The on-call surgeon would assume the operative management of trauma that the previous day's on-call surgeon and senior resident had arranged. During the day, phone calls for the on-call surgeon (typically scrubbed in the operating room [OR]), were numerous and generally managed by the circulating nurse in the OR as the go-between for the surgeon and the physician on the phone; the nurses were upset by this added workload. An "orthopedic trauma service" was established at RUH where residents completed 3-month rotations. Their duties included primary coverage of the ward and the ED and emergency surgery. Since there were now trauma-specific residents, the daytime activities of the non-trauma service residents were uninterrupted. By coincidence, the postgraduate positions available to the College of Medicine increased at the same time, and the orthopedic residency program received an additional resident position. This increased the resident complement from 2 to 3 positions per year. It became evident early on that the new system was flawed: on-call trauma residents sensed that they had little connection with the surgeon on-call, as he or she was almost exclusively in the OR while the residents were scrambling between the OR, the ward and the ED. Residents felt that they were inundated

with new service work on various fronts and that they had little support.

The system was revised again. A second faculty surgeon was placed on-call for the ED and the ward at RUH and for consultations at all 3 hospitals from 08:00 to 16:00. To provide continuity of care, the same surgeon was on-call from Monday through Friday. This surgeon accompanied the trauma residents on daily ward rounds at 07:00 and was the first contact for outside calls and ED staff during the day. The surgeon would then decide if a resident needed to be called. This new system allowed for 1 or more of the trauma residents to be available for surgery at 08:00, while the resident who was not in the OR would respond to calls from the ward and from the ED. At 16:00, the ward surgeon handed over responsibility for the ED, ward and RUH consultations to the surgeon who had been in the trauma OR for the day and then took over responsibility for evening and night ward care at the 2 community hospitals. In short, surgeons handed care of their inpatients to one of their colleagues every night of the week, achieving some continuity-of-care for patients. As a result, the surgeon in the OR was not interrupted and there was more focused intraoperative activity by nursing staff. Although the residents saw these new features as a step forward, they were wary of further staff-engineered change, as recent experiences had been unsatisfactory.

The objectives of our study were to measure resident workload in the ED, OR and ward before and after consolidation and measure the perceptions of residents and faculty on the newly established orthopedic trauma service.

METHODS

The hospital health records department provided the following data for 2 equal time periods before (September–November 2004) and after (September–November 2006) trauma consolidation:

- volume of orthopedic trauma at RUH;
- volume of orthopedic work in the ED and ward at RUH;
- hours of orthopedic work in the OR at RUH, from which we could extract details such as daytime and evening activity and junior and senior resident involvement; and
- the number of orthopedic trauma OR patients, with identification of junior and senior resident participation, at RUH.

We devised and administered 2 questionnaires, 1 for residents and 1 for faculty members, to explore their perceptions of the consolidation. The questions were similar, but there were resident-specific and faculty member-specific questions. The resident questionnaire comprised 55 questions covering patient care ($n = 8$), resident education ($n = 35$), resident well-being ($n = 8$) and the orthopedic trauma service ($n = 4$). The faculty questionnaire

comprised 64 questions covering patient care ($n = 9$), resident education ($n = 34$), resident well-being ($n = 7$), the orthopedic trauma service ($n = 5$) and faculty practice ($n = 9$). We used a 7-point Likert scale ranging from a response of “strongly agree” to “strongly disagree.”

RESULTS

Quantitative

After consolidation, the number of patients seen by orthopedic residents in the ED increased by 67%, the number admitted through the ED to the ward increased by 66% and the total number of inpatients and consultations increased by 43% (Table 1). The number of patients processed through the orthopedic emergency OR increased by 90% (Table 2). The volume of senior resident involvement did not change; however, that of the junior residents increased by 30%. Whereas before consolidation junior and senior residents often handled the same OR patient, after consolidation residents were one-on-one with a faculty member, often with a surgical assistant. Preconsolidation, there was limited access to the OR during the day: 62% of patients had surgery during the day and 38% had

Table 1. The number of patients assessed by orthopedic residents in the ED and admitted through the ED to the ward, the total number of inpatients and consultations and the percentage change over 2 similar 3-month periods (September–November)

Variable	Year, no. *		
	2004	2006	% change
Patients seen in ED	407	679	+167
Patients admitted through ED	186	308	+166
Total inpatients including consults	568	813	+143
Admission rate through ED, %	45.70	45.36	0

ED = emergency department.
*Unless otherwise indicated.

Table 2. The number of patients processed through the orthopedic emergency operating room in 2 similar 3-month periods (September–November) and the volumes of senior resident, junior resident and surgical assistant involvement

Variable	Year, no.		
	2004	2006	% change
Total emergency procedures	209	397	+190
Senior resident involvement	167	168	0
Junior resident involvement	118	155	+130
Senior resident only	87	139	+160
Junior resident only	38	126	+332
Senior and junior residents present	80	29	-36
Attending staff alone	4	16	+400
Corrected for second on-call surgeon	3	4	
Assistant (no resident)	0	87	

surgery after hours. Postconsolidation, the dedicated OR for orthopedic emergencies captured 88% of surgeries during the day, and the absolute number of after-hours surgeries decreased from 80 to 47 (Fig. 1).

Qualitative

Every resident and faculty member, except for us, completed the questionnaires.

Patient care

Residents and faculty members agreed that trauma consolidation enhanced patient care. Features that contributed to this enhancement included a dedicated orthopedic trauma service, a faculty member being responsible for organized morning ward rounds and overall ward management for a full week at a time, and a single point of orthopedic emergency service.

Resident education

Questions related to resident education probed issues of workload in the ED, the OR and the ward, and whether these changes were educationally positive. For most issues the overall resident responses were positive, but they were less positive than faculty members' responses to the same questions. The residents did not interpret the workload on the trauma ward as educationally positive. When asked if the balance between service and education was better on the new orthopedic trauma service, the answers were generally noncommittal by residents, whereas faculty members somewhat agreed. The residents did not feel the changes augmented their CanMEDS education. For scholarly activity, the responses were somewhat negative (Fig. 2).

Resident well-being

Some of the questions targeting resident well-being explored whether the amount of time spent in the ED after midnight had increased, whether the amount of time that residents slept had decreased, whether residents felt

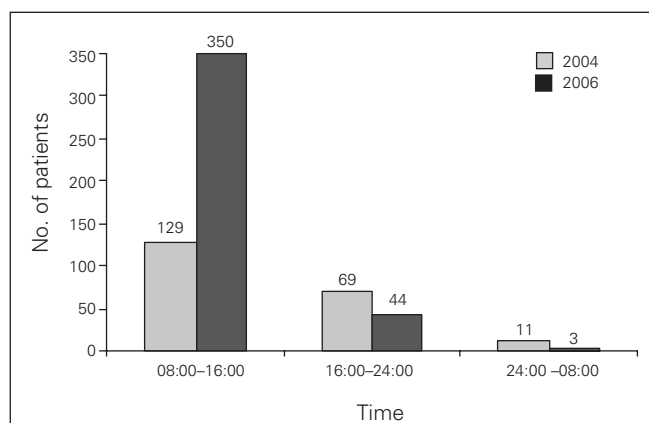


Fig. 1. Orthopedic emergency surgery volumes and their timing during the day, before and after trauma consolidation.

that faculty members were mindful of their workload, and whether the new orthopedic trauma service constituted a step in the right direction. There was disagreement among residents and faculty members about activity after midnight; residents reported that they were at RUH more often and slept less, whereas faculty members disagreed. Although residents and faculty members agreed that faculty members were mindful of residents and their workload and that the new orthopedic trauma service was a positive step, the faculty members were more enthusiastic than were the residents about those changes.

Orthopedic trauma service

To lessen the ED congestion with orthopedic emergencies from the other community hospitals, the faculty members requested that patients bypass the ED and be admitted directly to the ward. Residents did not like this system, whereas the faculty members had mixed opinions (Fig. 3).

Faculty practice

The faculty members supported the new orthopedic trauma system and strongly supported the transition to the daily 2-surgeon on-call pattern. Faculty members expressed a desire for an experienced assistant in the OR.

DISCUSSION

At the time of consolidation, orthopedic surgery residents felt their trauma exposure to be already adequate. They expected a trauma service to adversely affect the balance between education and service. Quantitatively, the volume of patients at RUH substantially increased, as did the workload of residents, although the absolute OR workload in the evening and night actually decreased. The residents indicated that as a result of the consolidation they were busier after midnight in the ED and that they had less

sleep while on call. Perhaps the more important observation was that faculty members believed the opposite: that the residents were less busy in the ED and that they had more sleep as a result of the changes associated with consolidation. Certainly the changes saw the faculty members being considerably less busy. Increased workload correlates with orthopedic resident burnout and psychiatric morbidity,¹ and duty-hour limitation has been associated with improvement in objective measures of orthopedic resident burnout.^{2,3} The discrepancy in opinion between residents and faculty members should be a call for the residency program committee to adopt strategies to counter this negative feature of consolidation. Both the residents and faculty members welcomed the daytime orthopedic trauma room, and it was this room that accommodated nearly 90% of the total emergency orthopedic volumes. The senior and junior trauma residents mutually decided who would attend the surgeries of the day, with the senior resident being the final decision-maker. The junior residents took advantage of the increased number of daytime surgeries; the number of operations that the senior residents attended also increased albeit to a lesser extent. This disproportion of OR activity may reflect the increased number of junior residents and the increased volume of primarily single-limb traumas that would have otherwise been referred to the community hospitals for management before the consolidation. Senior residents preferentially attended more complex operations. When a junior resident was in the trauma OR, the senior resident would be responsible for calls to the emergency department or ward.

Direct-to-ward admissions constituted a sensitive issue among the residents. An attractive solution to a chronically congested ED was to bypass the ED altogether and admit patients from peripheral hospitals directly to the ward. With this change, transfers typically occurred in the late evening. There were several instances of patients being

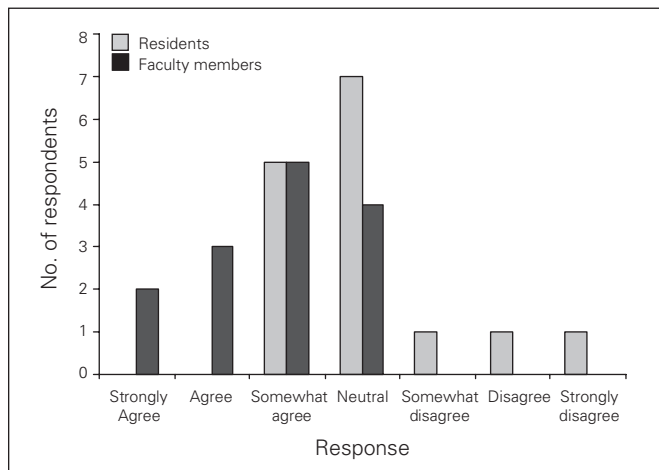


Fig. 2. Resident and faculty member responses to the question, "Has the establishment of an orthopedic trauma service given the resident or faculty member opportunities that they had not previously had to improve their scholarly CanMEDS role?"

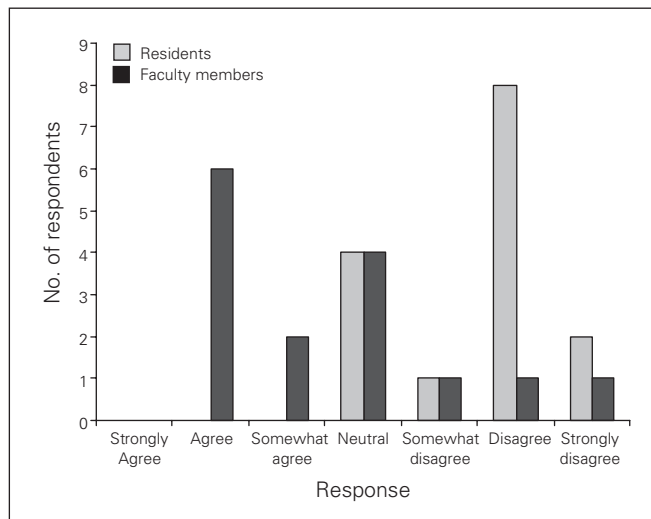


Fig. 3. Resident and faculty member responses to the question, "Should faculty increase the number of direct-admit patients?"

admitted to the ward with supposedly uncomplicated ankle fractures that turned out to be dislocations. Concerns were raised about the safety of direct-to-ward admissions; however, residents otherwise supported the direct admission of patients with uncomplicated hip fractures to the ward. Another source of resident and faculty opinion discordance concerned the “Scholar” role of the CanMEDS framework: residents thought that the new trauma system did not enhance their roles as scholars, whereas faculty members did. Despite the consolidation of the trauma system to 1 site, residents and faculty members have not taken advantage of this concentration of data, either to analyze the data or initiate clinical trials.

Theoretically, residents are unable to compare the past and present from the same perspective, as over the 2-year interval evaluated in our study they progressed through their residencies from junior to senior resident roles. We devised the questionnaires to cover numerous fronts related to service, education, resident well-being and system changes, but the questionnaires were not formally validated. At most, they assessed opinions, which were presumed to reflect the reality. Our study identifies that, although not all of the original objectives of trauma consolidation and the establishment of the orthopedic trauma service were achieved, a base on which to reference future assessments has been established. The information gleaned

from both resident staff and faculty members should provide the orthopedic residency program committee with valuable information. The committee will have to ensure that the items related to resident education, research and well-being are appropriately addressed. Questionnaires conducted before and after a planned change permit a more formal evaluation of major change. This is especially important in the educational domain, where faculty members (teachers) may underestimate the impact of change on their residents (students).

Competing interests: None declared.

Contributors: Drs. Johnston and Martins designed the study, acquired and analyzed the data, reviewed the article and approved its publication. Dr. Johnston wrote the article.

References

1. Sargent MC, Sotile W, Sotile MO, et al. Stress and coping among orthopaedic surgery residents and faculty. *J Bone Joint Surg Am* 2004; 86:1579-86.
2. Barrack RL, Miller LS, Sotile WM, et al. Effect of duty hour standards on burnout among orthopaedic surgery residents. *Clin Orthop Relat Res* 2006;449:134-7.
3. Friedlaender GE. The 80-hour duty week. *Clin Orthop Relat Res* 2006;449:138-42.

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