

# Morning report decreases length of stay in trauma patients

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Received 16 April 2018

Revised 2 July 2018

Accepted 23 July 2018

## ABSTRACT

**Background** Modern acute care surgery (ACS) programs depend on consistent patient hand-offs to facilitate care, as most programs have transitioned to shift-based coverage. We sought to determine the impact of implementing a morning report (MR) model on patient outcomes in the trauma service of a tertiary care center.

**Methods** The University of Arkansas for Medical Sciences (UAMS) Division of ACS implemented MR in October 2015, which consists of the trauma day team, the emergency general surgery day team, and a combined night float team. This study queried the UAMS Trauma Registry and the Arkansas Clinical Data Repository for all patients meeting the National Trauma Data Bank inclusion criteria from January 1, 2011 to April 30, 2018. Bivariate frequency statistics and generalized linear model were run using STATA V.14.2

**Results** A total of 11 253 patients (pre-MR, n=6556; post-MR, n=4697) were analyzed in this study. The generalized linear model indicates that implementation of MR resulted in a significant decrease in length of stay (LOS) in trauma patients.

**Discussion** This study describes an approach to improving patient outcomes in a trauma surgery service of a tertiary care center. The data show how an MR session can allow for patients to get out of the hospital faster; however, broader implications of these sessions have yet to be studied. Further work is needed to describe the decisions being made that allow for a decreased LOS, what dynamics exist between the attendings and the residents in these sessions, and if these sessions can show some of the same benefits in other surgical services.

**Level of evidence** Level 4, Care Management.

## BACKGROUND

Communication is fundamental to efficient and effective patient hand-offs. These hand-offs from one shift to the next are essential for the continuity of care needed in team-based care models. One area in which the necessity of effective communication cannot be more clearly illustrated is the field of surgery. According to a comprehensive review of over 400 surgical malpractice claims by Greenberg *et al*,<sup>1</sup> more than 13% of these claims were due to communication failures, most of which occurred preoperatively during shift change. It is in academic medical centers that these transitions of care tend to occur rapidly and inefficiently, setting the stage for medical errors to be made.<sup>2</sup>

As a means to improve patient outcomes, efficiency, and quality, other specialties have instituted daily morning conferences in which patients are handed off between night and day teams.<sup>3</sup> Physician survey data suggest that morning report (MR) is an effective way to transition between teams, ensuring all pertinent patient information is accurately communicated.<sup>4</sup> This collaboration leads to rapid implementation of the most effective treatment plan for a patient. It has been shown to decrease length of stay (LOS) in medical patients by  $2.14 \pm 0.81$  days, as well as overall hospital charges by  $\$1068.50 \pm \$260.98$ .<sup>3</sup>

The MR model has yet to be fully characterized in the surgical field, particularly within the practice of acute care surgery (ACS). In a comprehensive study of ACS team hand-offs, Pringle *et al*<sup>5</sup> described the variability of ACS surgeons using a comprehensive MR model. The culture of patient hand-offs in the Division of ACS at the University of Arkansas for Medical Sciences (UAMS) has drastically changed after the discovery of ineffective time, location, and poor resident education associated with these hand-offs.<sup>6</sup> The role of this study was to determine the impact that the newly implemented MR model has had on trauma patient outcomes in a statewide, level 1, tertiary care facility.

## METHODS

In October 2015, the UAMS Division of ACS implemented MR into their patient hand-off practices. This model consists of attending-supervised patient hand-offs occurring every morning between 06:00 and 07:00. The emergency general surgery service day team, the trauma surgery service day team, and a night float team shared by the two services participate in these sessions. Most recently, the surgical intensive care unit (SICU) team has also been included in this morning conference. All trauma admissions, trauma team activations, trauma consults, and SICU admissions from the previous 24 hours are discussed. A plan of care for each patient is then made for the day.

This study queried the UAMS Trauma Registry and the Arkansas Clinical Data Repository for all patients meeting the National Trauma Data Bank inclusion criteria from January 1, 2011 to April 30 2018.<sup>7</sup> Patients were assigned into pre-MR and post-MR cohorts with the entire data set described in terms of age, gender, mode of arrival, mechanism of injury (blunt, burn, or penetrating), injury severity (Injury Severity Score (ISS), Trauma and

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**To cite:** Wolfe JD, Gardner JR, Beck WC, *et al*. *Trauma Surg Acute Care Open* 2018;**3**:e000185.

**Table 1** Pre versus post inpatient bivariate analysis

	Premorning report (n=6556)	Postmorning report (n=4697)	P values
Age, years	45.2±19.4	49.4±20.9	<0.0001
Male, n (%)	4579 (69.8)	3050 (64.9)	<0.0001
Mode of arrival			0.932
Air, n (%)	1351 (20.6)	971 (20.7)	
Ground, n (%)	5205 (79.4)	3726 (79.3)	
Mechanism of injury			<0.0001
Blunt, n (%)	5419 (82.7)	4175 (88.9)	
Burn, n (%)	28 (0.4)	23 (0.5)	
Penetrating, n (%)	1109 (16.9)	499 (10.6)	
ISS	11.2±9.5	11.5±10.3	0.144
NISS	14.8±12.1	15.2±13.6	0.091
TRISS	1.0±0.13	1.0±0.13	0.535
GCS score at admission, n (%)			0.728
<13	880 (13.5)	623 (13.3)	
13–15	5632 (86.5)	4066 (86.7)	
Alive, %	6297 (96.0)	4546 (96.8)	0.040
Length of stay (0 removed)	6.0±8.5	4.9±6.5	<0.0001
Intensive care unit length of stay	2.1±5.0	1.5±3.8	<0.0001
Total vent days	1.3±4.4	0.9±3.0	<0.0001
Number of comorbidities	1.9±1.2	2.1±1.5	0.001

GCS, Glasgow Coma Scale; ISS, Injury Severity Score; NISS, New Injury Severity Score; TRISS, Trauma and Injury Severity Score.

Injury Severity Score (TRISS), Glasgow Coma Scale (GCS)), hospital disposition (% alive), LOS (overall and intensive care unit (ICU)), and days spent on ventilatory support.

The data set included only those patients admitted to the hospital (LOS≥1). We used the international ISS to differentiate between mild (ISS<15) and moderate to severe (ISS>15) injuries. The ISS cut-off values for mild to moderate/severe injury are based on the increased likelihood of trauma activation with multisystem trauma in those patients scored >15.<sup>8</sup>

Using STATA V.14.2 a bivariate analysis was performed for differences between the means for patient subgroups in the pre-MR and post-MR time period. Using Student's t-test for continuous variables and  $\chi^2$  tests for categorical variables, all subgroups were compared. A generalized linear model was used to evaluate the effect of MR on LOS. Statistical significance was set at  $\alpha=0.05$  for all analyses.

## RESULTS

This study included a total of 11 253 patients who met the National Trauma Database inclusion criteria (pre-MR, n=6556; post-MR, n=4697). **Table 1** defines the data set in terms of age, gender, mode of arrival, mechanism of injury (blunt, burn, penetrating), injury severity (ISS, New Injury Severity Score (NISS), TRISS), GCS score (<13, 13–15), mortality (% alive), LOS, and vent days.

The pre-MR and post-MR cohorts were not significantly different in mode of arrival (p=0.932), ISS (p=0.144), NISS (p=0.091), TRISS (p=0.535), or admission GCS score (p=0.14). However, they were different in their age (p<0.0001), gender (p<0.0001), mortality rates (p=0.040), LOS (p<0.0001), ICU LOS (p<0.0001), and number of days on ventilator support (p<0.0001). Specifically, the number of patients who were alive at discharge (% alive) was increased in the post-MR cohort by

**Table 2** Generalized linear regression

Variable	Coefficient	P values	95% CI
Postmorning report	-0.108	0.000	-0.156 to -0.050
Age	0.003	0.000	0.003 to 0.004
Male*	0.021	0.070	-0.002 to 0.044
Number of comorbidities	0.071	0.000	0.063 to 0.079
TRISS	-0.201	0.000	-0.288 to -0.114
Mechanism of injury: blunt†	0.001	0.964	-0.028 to 0.029
Mechanism of injury: burn†	-1.153	0.103	-2.54 to 0.233
Moderate GCS‡	0.536	0.000	0.489 to 0.583
Severe GCS‡	0.455	0.000	0.411 to 0.499
ISS>15	0.900	0.000	0.877 to 0.923
Constant	1.252	0.000	1.151 to 1.352

\*Referent is female.  
†Referent is mechanism of injury: penetrating.  
‡Referent is mild GCS.  
GCS, Glasgow Coma Scale; ISS, Injury Severity Score; TRISS, Trauma and Injury Severity Score.

less than 1%. In post-MR patients, the overall LOS decreased by ~1 day, the ICU LOS decreased by ~0.5 days, and the total vent days decreased by ~0.4 days.

**Table 2** presents the results from a generalized linear regression model, which was selected since the dependent variable, LOS, has a positively skewed distribution. This model was used to determine the effect of the post-MR on LOS, while controlling for other patient characteristics. The implementation of MR was found to significantly reduce the LOS in trauma patients. TRISS was also found to significantly reduce the LOS in trauma patients, whereas age, number of comorbidities, moderate GCS (as compared with mild GCS), severe GCS (as compared with mild GCS), and ISS>15 were found to significantly increase LOS in trauma patients.

## DISCUSSION

In this study, we hypothesized that MR would improve outcomes in trauma patients. Analysis of the data showed that the most significant effect of MR was a decrease in the overall LOS between pre-MR and post-MR patients. A further analysis of these patients revealed that LOS in the ICU was also decreased, as well as how many days these patients were required to be on ventilator support.

The importance of a decreased LOS is illustrated by the impact on the patient. Although certain subsets of patients benefit from an extended stay in the ICU, the majority of both medicine and surgery patients are at an increased risk of mortality the longer they spend in the hospital.<sup>9</sup> This increased mortality can be attributed to many different factors; however, none have been more extensively studied than infection rates. Barnett *et al*<sup>10</sup> have described the significant correlation between an increased LOS and hospital-acquired bloodstream infections.

MR also serves an important role in the systematic process of trauma care. It allows for real-time quality improvement. System issues are identified rapidly and corrections are expeditiously made to any inefficiency or error. This process encompasses the entire system of care for trauma patients, extending from the emergency medical service transfer all the way into the operating room (OR) and postoperative care.

Interdisciplinary rounds, such as MR, have been shown to improve interprofessional education and to help deliver a higher quality of patient care.<sup>11</sup> These daily conferences allow

for individuals from all aspects of trauma care to be involved in the day-to-day healthcare decisions of a patient. All parties are afforded the opportunity to contribute to patient care, which allows for a more efficient and consistent hospital stay for patients.

The main limitation of this study is the inability to stratify confounding variables. These variables include the time it took for a patient to get to the OR and the correlation of specific injuries of a patient to their LOS. One could hypothesize that MR would improve the time it took for a patient to get to the OR, which would explain the decreased LOS for patients in the post-MR cohort. In this study, we broke mechanism of injury into three categories for simplicity of statistical analysis. Injury mechanism is different for every individual, and this categorization generalized injuries for pre-MR and post-MR cohorts. This could have affected the overall LOS results. Ideally, a randomized controlled trial would be conducted in which individuals were randomized into the pre-MR or post-MR cohort. However, this would be unethical given that MR has already been shown to benefit the patient in previous studies.

This study describes an implementable approach to improving patient outcomes in the trauma surgery service of a tertiary care center. The data show how an MR model can decrease LOS; however, broader implications of these sessions have yet to be studied. Further work is needed to describe the specific decisions being made that allow for decreased LOS, what dynamics exist between the attendings and the residents in these sessions, and if these sessions can show some of the same benefits in other surgical services.

**Acknowledgements** This study was made possible by the UAMS Division of Trauma and Acute Care Surgery with support from the UAMS Clinician Scientist Program and the Arkansas Clinical Data Repository. Data for this study were provided by the Arkansas Clinical Data Repository (AR-CDR) maintained by the Department of Biomedical Informatics in the College of Medicine at the University of Arkansas for Medical Sciences (UAMS). The AR-CDR is approved to operate as an enterprise data resource to support research across UAMS. Data in the AR-CDR come from the UAMS Electronic Medical Record (EMR), tumor registry, billing, and cancer genomic data, and comprise encounters since May 1, 2014.

**Contributors** All individuals listed as authors of this review article have participated in its drafting, in conceptualizing the research or content of the article, and in writing or critically editing the article.

**Funding** The project described was supported by the Translational Research Institute (TRI; grant IU54TR001629-01A1) through the National Center for Advancing Translational Sciences of the National Institutes of Health (NIH). The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH. KWS is supported by the UAMS Clinician Scientist Program.

**Competing interests** None declared.

**Patient consent** Not required.

**Ethics approval** This study was conducted in accordance with all applicable government regulations and UAMS research policies and procedures. The UAMS Institutional Review Board approved this study and granted a waiver of informed consent for this research involved no more than minimal risk to the subjects.

**Provenance and peer review** Not commissioned; externally peer reviewed.

**Data sharing statement** We shall make data available to the scientific community with as few restrictions as feasible, while retaining exclusive use until the publication of major outputs. Written requests for data should be sent to kevin.sexton@uams.edu.

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## REFERENCES

- Greenberg CC, Regenbogen SE, Studdert DM, Lipsitz SR, Rogers SO, Zinner MJ, Gawande AA. Patterns of communication breakdowns resulting in injury to surgical patients. *J Am Coll Surg* 2007;204:533–40.
- Duong JA, Jensen TP, Morduchowicz S, Mourad M, Harrison JD, Ranji SR. Exploring physician perspectives of residency holdover handoffs: A qualitative study to understand an increasingly important type of handoff. *J Gen Intern Med* 2017;32:654–9.
- Boushehri E, Khamseh ME, Farshchi A, Aghili R, Malek M, Ebrahim Valojerdi A. Effects of morning report case presentation on length of stay and hospitalisation costs. *Med Educ* 2013;47:711–6.
- Ludvigsson A, Wernberg E, Pikwer A, Åkeson J. Morning conferences for anaesthesiologists - to be or not to be? *Acta Anaesthesiol Scand* 2013;57:971–7.
- Pringle PL, Collins C, Santry HP. Utilization of morning report by acute care surgery teams: results from a qualitative study. *Am J Surg* 2013;206:647–54.
- Khandelwal C, Mizell J, Steliga M, Berry K, Kimbrough MK, Bentley F, Clardy J. Standardizing the culture of trauma rotation handoffs. *J Surg Educ* 2014;71:601–5.
- SciencesUoAfM. 2018.ArkansasClinical Data Repository <https://ar-cdr.uams.edu/>.
- Moore HB, Moore EE, Gonzalez E, Chapman MP, Chin TL, Silliman CC, Banerjee A, Sauaia A. Hyperfibrinolysis, physiologic fibrinolysis, and fibrinolysis shutdown: the spectrum of postinjury fibrinolysis and relevance to antifibrinolytic therapy. *J Trauma Acute Care Surg* 2014;77:811–7.
- Kisat MT, Latif A, Zogg CK, Haut ER, Zafar SN, Hashmi ZG, Oyetunji TA, Cornwell EE, Zafar H, Haider AH, et al. Survival outcomes after prolonged intensive care unit length of stay among trauma patients: The evidence for never giving up. *Surgery* 2016;160:771–80.
- Barnett AG, Page K, Campbell M, Martin E, Rashleigh-Rolls R, Halton K, Paterson DL, Hall L, Jimmieson N, White K, et al. The increased risks of death and extra lengths of hospital and ICU stay from hospital-acquired bloodstream infections: a case-control study. *BMJ Open* 2013;3:e003587.
- Urisman T, Garcia A, Harris HW. Impact of surgical intensive care unit interdisciplinary rounds on interprofessional collaboration and quality of care: Mixed qualitative-quantitative study. *Intensive Crit Care Nurs* 2018;44:18–23.