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Stressors contributing to burnout among acute care and trauma surgery care teams: a systems-analysis approach

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ABSTRACT

Background Burnout negatively impacts healthcare professionals' well-being, leading to an increased risk of human errors and patient harm. There are limited assessments of burnout and associated stressors among acute care and trauma surgery teams.

Methods Acute care and trauma surgery team members at a US academic medical center were administered a survey that included a 2-item Maslach Burnout Inventory and 21 workplace stressors based on the National Academy of Medicine's systems model of clinician burnout and professional well-being. Stressors were summarized and presented to participants in focus groups. Contextual inquiries (CIs) were conducted to gather additional information about key stressors. Qualitative data were used to generate an affinity model, which participants then validated and used to prioritize top stressors. Participants rated stressors by level of impact and level of effort, and improvement recommendations were made based on these results.

Results 74% (n=14/19) acute care and trauma surgery team members reported high burnout. Key stressors included inadequate staffing, organizational culture, excessive workload, and inefficient workflows. Attending faculty (surgeons) classified the following key priorities for improvement: (i) improve throughput and patient flow, (ii) provide better information technology support, and (iii) improve rewards and support. Non-faculty (advanced practice providers (APPs), nurses, staff) classified the following for improvement: (i) align APP job responsibilities, (ii) improve lack of recognition from leadership, and (iii) robust and consistent APP training.

Conclusions A contextual design approach to studying burnout using surveys, focus groups, CIs, modeling, and validation and prioritization is a feasible method for identifying key stressors and improvements that may enable more impactful and appropriately targeted interventions. Results indicate high levels of burnout among acute care and trauma surgery team members, requiring prioritized attention to operational and relationship issues necessary to care for patients. Efforts to improve surgery teams' workflows, auxiliary support, compensation, and relationships with leadership may address burnout.

Level of evidence Level V.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Burnout has been declared an 'occupational phenomenon' by WHO in 2019 and has been exacerbated by COVID-19 in healthcare settings.
⇒ In particular, a high prevalence of burnout was found among acute care and trauma surgery care teams due to inefficient workflows, complex work environments and schedules, and relationships.
⇒ Additional COVID-19-related stressors among acute care and trauma surgery teams include leadership burnout and patient factors.

WHAT THIS STUDY ADDS

⇒ This study adds to the growing body of knowledge on stressors contributing to burnout among healthcare professionals, specifically acute care and trauma surgery care teams.
⇒ In particular, this study demonstrates the feasibility of a contextual design approach to identify key stressors and improvements among an acute care and trauma surgery care team and may serve as a methodological template for future studies in other divisions to identify core stressors and drivers contributing to burnout, prioritized actions, and systems-focused interventions.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ This study elucidates actionable areas of improvement in acute care and trauma surgery and presents a feasible and comprehensive methodology for identifying stressors contributing to burnout and prioritized areas of improvement that can be translatable to other divisions and institutions.

INTRODUCTION

Burnout is characterized by emotional exhaustion (EE), depersonalization (DP), and a decreased sense of accomplishment due to workplace stress.[1] Burnout is a job-related syndrome impacting healthcare teams, and consequently, their patients, particularly with the prevalence of burnout increasing among clinicians and support staff.[2] Prior research found a high prevalence of burnout among acute care and trauma surgery care teams resulting from high patient acuity, complex work environments, and stressors unique to the trauma population, with burnout associated with the impairment of the professional and personal lives of acute care

and trauma care surgery clinicians.[3 4] Burnout among acute care and trauma surgery teams has been exacerbated by COVID-19, emphasizing the need to identify contributing stressors and implement system reforms to improve well-being.[5 6]

While there have been several studies quantifying the levels of burnout, few studies have performed an in-depth assessment into the stressors contributing to burnout among acute care and trauma surgery teams. Of these studies, stressors contributing to burnout among acute care and trauma surgery teams have predominantly been assessed using surveys.[3 5 7] However, these studies acknowledge that assessment via survey has limitations, including potential bias (eg, response bias, social desirability, interpretation) and response rates. Consequently, studies using other analyses and data collection methods are needed to comprehensively capture stressors contributing to burnout.

A systems-analysis approach is a more formal method to gather data related to the stressors contributing to burnout. This approach incorporates knowledge of stakeholders and their goals, activities, technologies, and environments to understand the system and its complexities as a whole.[8] This systems approach has been applied in healthcare (eg, to obesity prevention,[9] mental health,[10] and COVID-19[11]), but there have been few studies using a systems-analysis approach to address burnout. The National Academy of Medicine (NAM) has developed its own systems-analysis-based model (NAM model) to study clinician burnout and professional well-being. To the best of our knowledge, previous studies have not explored stressors associated with burnout using a systems-analysis approach and associated data collection methods among acute care and trauma surgery teams. By assessing stressors contributing to burnout using the NAM model, health systems may be better equipped to improve clinician well-being.[8] In order to further study this issue, we used a systems-analysis approach to assess the magnitude of burnout and associated stressors among one acute care and trauma surgery care team (surgeons, nurses, and staff) at a US academic medical institution.

METHODS

Study overview

A sequential mixed-methods, participatory, and data-driven study design based on the contextual design approach[12] was used to gather, identify, analyze, and model burnout data among 19 acute care and trauma surgery attending faculty (surgeons) and non-faculty (advanced practice providers (APPs), nurses, and clinic staff) at a US academic medical institution between February 14, 2022 and April 30, 2022. The study protocol was reviewed and the methodology was published and deployed among hospitalists prior to the COVID-19 pandemic.[13 14] Research team members underwent human subjects research training prior to participating in the study. The study included an electronic survey, focus groups, contextual inquiries (CIs), modeling, a validation and prioritization session, and impact/effort rating.

The study started with a survey as a broad data collection method for qualitative and quantitative data on burnout and workplace stressors. Focus groups were used to present the survey data back to participants so they could provide additional, contextual information for top-rated stressors. Focus groups were followed by CIs to gather further qualitative information in a naturalistic setting. These three data collection methods were used to build an affinity model to comprehensively capture data and sort them into themes. The order of our study allowed the research team to start with broader data gathering methods and gradually move towards more narrow, specific, and detailed data collection. Details regarding the survey, focus groups, CIs, and affinity model are provided below.

Survey

An electronic survey was administered to the attending faculty, APPs, nurses, and clinic staff in the acute care and trauma surgery division at a US academic medical center. The survey included a two-item abbreviated Maslach Burnout Inventory (MBI) measuring EE and DP, and 21 general workplace stressors based on the NAM model. Participants rated the severity of workplace stressors on a 5-item Likert scale and rated the priorities for improvements on a 4-item Likert scale. Of the 21 stressors in the NAM model, 10 are categorized as 'job demands'—various intrinsic aspects of clinical work and work inefficiencies—and 11 are categorized as 'job resources'—the tangible and intangible resources within the work environment.

Burnout was categorized using a 2-Question Summative Score totaling >3 for EE and DP.[15] Participants responded to two statements, "I feel burned out from my work" (EE) and "I have become more callous toward people since I took this job" (DP) and selected responses based on a 6-point Likert scale ('a few times a year or less,' 'once a month or less,' 'a few times a month,' 'once a week,' 'a few times a week,' and 'everyday'). Summative scores for both EE and DP questions totaling >3 correlated with burnout.[15]

Focus groups

Three focus groups consisting of five to eight participants per group were conducted using a focus group guide that was developed and validated by research team members within the academic medical center's well-being program (online supplemental materials 2). Each group included mixed roles (ie, attending faculty, APPs, nurses, and staff). The purpose of these groups was to gather additional information on top-ranked workplace stressors from the survey. At the start of each focus group, the focus group's purpose and agenda was stated by a research team member. Research team members created a safe focus group environment for empowering both non-faculty and faculty to provide contextual information on stressors by asking participants to focus on system-level stressors, rather than trying to solve any problems. The quantitative results for the top-rated work system stressors and top-ranked priorities as well as textual survey responses from the top-rated workplace stressor and top-ranked priorities were summarized and presented to each focus group. Participants were given time to read and reflect on each workplace stressor. They were asked open-ended questions to promote discussion and to elicit more contextual information about each of the workplace stressors. Participants were asked to focus on describing the problems in the current system and providing detailed contextual information, rather than speculating about possible solutions. At the end of each focus group, participants were asked to prioritize the key stressors by priority of improvement via a brief survey to identify how and if any stressors had shifted in priority for them.

Contextual inquiries

CIs are observations and interviews conducted in the user's natural environment to better understand human behavior and practices in that context.[12] CIs were used to gather information about key stressors contributing to burnout among attending faculty, APPs, nurses, and staff, and gain insight into system breakdowns and day-to-day operations. Participants had the

option to end the CI at any point if they wanted to. CIs involved one or two trained research team members shadowing one participant, allowing them to describe their tasks when appropriate, and asking questions when it was not intrusive or interrupting their flow. During the CI, participants were observed in situ (eg, operating room (OR), clinic, trauma bay, surgical floor, surgical intensive care unit (SICU), intermediate surgical care unit (ISCU)) for approximately 4–8 hours. Each observation session was followed by a 30 min semi-structured interview to provide participants an opportunity to further elaborate on key work system stressors. Interviews were conducted in private locations (eg, conference room, empty break room). Observations and responses were captured by research team members with notetaking. At the end of each CI, the research team member reviewed the notes with the participant to ensure all information was captured accurately and that any information the participant did not want shared was removed. Each CI was presented at a weekly interpretation session with the research team to report and discuss the key findings from CI sessions.

Affinity model

Using qualitative data from the survey, focus groups, and CIs, affinity models were built to aggregate, identify, and categorize the key breakdowns and stressors using the NAM model and methodology described by Holtzblatt and Beyer.[8 12] The affinity model was created by taking each individual breakdown or stressor as a data point and organizing the data points into themes and subthemes based on their perceived similarity. By grouping data points into thematic categories, an overarching structure emerges which demonstrates how breakdowns and stressors interconnect. Two affinity models were created: one for attending faculty (surgeons) and one for non-faculty (APPs, nurses, and staff), due to the differences in work systems, functions, and stressors for faculty versus non-faculty roles.

Validation and prioritization

The affinity models were then presented to participants for validation to verify completeness and accuracy of the data. Two validation and prioritization sessions were held: one for attending faculty and one for APPs, nurses, and staff. Validation and prioritization sessions were either hybrid or remote to accommodate participants' schedules. Participants were asked to validate the data by leaving the text black if they agreed with a data point, marking or changing the text to orange if they disagreed with a data point, and amending or annotating any data points in green or blue text. Participants were also asked to prioritize their top five stressors contributing to burnout for improvement.

The affinity models were then updated to include any items that were mentioned in the session and the level of disagreement on data points where there was no consensus among participants was quantified (the fraction of participants in the validation and prioritization sessions disagreeing with a specific data point). The validated affinity models were provided to system leadership.

Impact/Effort rating

The priorities from the validation and prioritization session were compiled by a research team member into two brief surveys (one for attending faculty and one for non-faculty) and participants classified the sorted priorities by level of impact (high, medium, and low impact) and level of effort (high, medium, and low effort) (online supplemental materials 4). The level of impact was defined by how much value or impact the outcomes will have on the division. The level of effort was defined as how much time, money, resources, and capacity will be needed to achieve the desired outcome. Responses were plotted on 2×2 matrices to visualize priorities based on impact versus effort. Based on these data, recommendations for improvement were made to system leadership for work system stressors contributing to burnout for both attending faculty and non-faculty. The Standards for Quality Improvement Reporting Excellence V.2.0 guidelines and checklist were used to report the work performed.[16]

RESULTS

Of the 21 acute care and trauma surgery team members invited to participate in the study, 19 individuals participated (90%; eight attending faculty, six APPs, two nurses, two staff, one clinic manager). No unintended consequences nor missing data were applicable with this study. Of the 19 participants, 79% identified as female, 68% identified as Caucasian, 74% were married, 89% were 25–54 years of age, and 47% stated they work 50+ hours per week.

Survey results

Nineteen (90%) acute care and trauma surgery team members responded to the electronic survey between February 14, 2022 and March 2, 2022 (online supplemental materials 1). Fourteen of the 19 participants (74%) met the criteria for being burned out (summative score of EE and DP >3), with a mean EE score of 3.21 (SD 1.32) and mean DP score of 2.26 (1.15). The key workplace stressors contributing most to burnout among acute care and trauma surgery care teams were inadequate staffing (mean (SD) 3.68 (0.95)), inefficient workflows (3.53 (1.22)), organizational culture (3.28 (1.36)), excessive workload (3.21 (1.08)), and interruptions and distractions (3.11 (1.05)). Table 1 provides a full list of workplace stressors and relative rankings contributing to acute care and trauma surgery team members' burnout.

Focus groups

Nineteen (90%) acute care and trauma surgery team members attended the focus groups (along with at least two research team member facilitators per group) between February 28, 2022 and March 11, 2022. Participants provided in-depth contextual information about the key work system stressors contributing to burnout. Comments from the focus groups and relevant stressors included:

- *Inadequate staffing*: high staff turnover results from trained APPs leaving because they are overloaded and are not easily replaceable; there is a lack of nurses providing support to attendings, APPs, and the OR, as well as an over-reliance on travelers in the OR, floor, SICU, and ISCU.
- *Inefficient workflows*: OR scheduling does not prioritize specialized equipment requirements and perception that OR staff lack incentive to turnover rooms or complete cases quickly; OR equipment are often missing or mismatched, and OR stocks are not always adequately replenished; inefficient patient check-out needs to be addressed; and clinic scheduling templates do not allow for scheduling appointments further than a month ahead.
- *Organizational culture*: 'It would be meaningful if the organization put in funds for training people in the ICU or for APPs to feel fulfilled and prevent turnover; the organization should listen to concerns of frontline workers, and invest in its providers hire more staff, clinic nurses, and APPs and reduce reliance on travelers.'

Table 1 Ratings and ranking of the extent to which workplace stressors contribute to acute care and trauma surgery team members' burnout

	Severity		Priority	
Workplace stressor	Rank	Mean (SD)	Rank	Mean (SD)
Inadequate staffing*	1	3.68 (0.95)	1	2.44 (0.81)
Inefficient workflows*	2	3.53 (1.22)	3	2.20 (0.86)
Organizational culture†	3	3.28 (1.36)	4	2.17 (0.72)
Excessive workload*	4	3.21 (1.08)	2	2.31 (0.75)
Interruptions and distractions*	5	3.11 (1.05)	15	1.67 (0.90)
Inadequate technology implementation*	6	2.84 (1.21)	6	2.00 (0.77)
Lack of recognition for quality improvement activities†	6	2.84 (1.38)	11	1.83 (0.83)
Extrinsic motivations and rewards†	8	2.83 (1.42)	5	2.08 (1.00)
Values and expectations alignment†	9	2.79 (1.36)	8	1.82 (0.90)
Patient factors*	10	2.74 (1.15)	21	1.38 (0.77)
Physical work environment†	11	2.63 (1.26)	9	1.91 (0.83)
Administrative burden*	12	2.58 (1.22)	13	1.73 (0.79)
Time pressure*	13	2.50 (0.79)	19	1.54 (0.66)
Work-life integration†	14	2.37 (1.12)	9	1.91 (0.83)
Lack of dedicated time for professional development requirements†	15	2.33 (1.14)	18	1.58 (0.79)
Job control (flexibility and autonomy)†	16	2.24 (0.83)	16	1.64 (0.81)
Unmanageable work schedules*	17	2.21 (1.03)	13	1.73 (0.79)
Moral distress*	17	2.21 (1.13)	16	1.64 (0.81)
Professional relationships†	17	2.21 (0.98)	12	1.82 (0.87)
Lack of support for research and teaching†	20	2.16 (1.21)	6	2.00 (0.77)
Intrinsic motivations and rewards†	21	2.05 (0.78)	20	1.44 (0.73)

*Job demands.
†Job resources.

- *Excessive workload*: APPs did a lot of work during the COVID-19 pandemic that has not been recognized or compensated; the clinic is open only 2 days a week, which creates overly busy clinic days and long wait times for patients; relative value unit compensation is capped at 150%, which can be a disincentive; and a lack of appropriately trained nurses and staff and the high use of travel nurses increases the workload of the existing APPs, nurses, and staff.

At the end of each focus group, participants prioritized the key stressors as follows: inadequate staffing remained the top priority for acute care and trauma surgery team members; organizational culture was moved to a higher priority (second priority rank vs fourth before focus groups); interruptions and distractions were moved to a higher priority (fifth priority rank vs 15th before focus groups).

Contextual inquiries

62% (n=13) of acute care and trauma surgery team members participated in CIs between March 12, 2022 and April 1, 2022. Attending faculty were observed in ORs, clinic, and ICU contexts. Non-faculty were observed in the clinic, ICUs, and on the floor. Faculty and non-faculty members were observed in different shifts (morning, afternoon, evenings) for 4–8 hours per CI session, followed by a 30 min semi-structured interview. Research team members observed 13 acute care and trauma surgery team members for a total of approximately 78 hours of CIs. Qualitative data were gathered from observations, comments, and interview responses, with themes and subthemes consolidated on the affinity model.

Affinity model

Qualitative data gathered from survey comments, focus group discussions, CIs, and semi-structured interviews were used to develop two affinity models: one for attending faculty and one for non-faculty (online supplemental materials 3).

Contextual information from survey comments, focus groups, and CIs resulted in 171 breakdowns for attending faculty and 148 breakdowns for non-faculty that were captured and organized on respective affinity models. The number of stressors (# of corresponding breakdowns) for main themes and subthemes are presented in tables 2 and 3.

Validation and prioritization

Validation and prioritization of key breakdowns and stressors was performed by 90% (n=9) of attending faculty and 73% (n=8) of non-faculty on respective affinity models. There was consensus (100% agreement among participants) for 72% of the breakdowns depicted in the affinity model for attending faculty and 41% of breakdowns for non-faculty. 28% (n=48) of the breakdowns had some level of disagreement among attending faculty (one or more participants disagreed with the stressor) and 59% (n=88) of the breakdowns had some level of disagreement among non-faculty. See tables 2 and 3 for detailed information.

Participants were also provided the opportunity to amend, annotate, or add any statements on the affinity model when validating the data. Attending faculty (n=9) generated 12 amendments/annotations and non-faculty (n=8) generated 12 amendments/annotations and four additional statements in their respective compiled affinity models. Amendments and annotations to the attending faculty affinity model included comments clarifying current inefficient workflows (eg, involving processes in the main OR, throughput and patient flow, and clinic), organizational support to achieve goals, and commentary on technology and IT support. Amendments and annotations to the non-faculty affinity model included clarification of the clinic scheduling workflow and current workarounds, commentary on how relationships and communication with other departments can introduce added stress, and workarounds for gaps in technology (eg, Epic, paging) implementation.

Impact/Effort rating

Nine distinct priorities for attending faculty and nine distinct priorities for non-faculty were identified and sorted by perceived level of impact and level of effort (figure 1). Top priorities were those that yielded the highest impact for the lowest effort. A summary description of all top priorities and other priorities is presented in table 4.

DISCUSSION

This study used a systems-analysis approach to evaluate stressors contributing to burnout among acute care and trauma surgery attending faculty (surgeons) and non-faculty (APPs, nurses, and staff) at a US academic medical center. Analysis of the results demonstrate high levels of burnout among acute care and trauma surgery team members. Validation and prioritization of the data and impact/effort ratings by participants revealed distinct foci for attending faculty and non-faculty.

Table 2 Key stressors and subthemes for work system stressors captured in the attending faculty affinity model

Stressor (total #)	Subthemes (#) within each stressor	Percentage (%) of participants in agreement after validation
Inefficient workflows (29)	OR (10) Patient logistics center (PLC; throughput and patient flow) (8) SICU and ISCU (6) Clinic (5)	96
Technology (28)	Electronic health record system (16) IT support, computers, hardware, software (9) Paging (3)	97
Organizational culture (35)	*Leadership* Lack of leadership support (4) Communication (4) Organization mission and goals (4) Accountability/Visibility (3) Equity (4) General (5)	97
	Decision making Poor prioritizations/decisions (8) Optics (2)	
	Relationships With other departments (1)	
Inadequate staffing (16)	Clinic (3) Floor (2) ED (1) OR (1) SICU/ISCU (2) General (7)	100
Organizational support (16)	Parking (1) Night shift support (1) Childcare (1) Grand rounds/Morbidity & Mortality conference (M&M) (2) Call room (2) Ancillary support/other groups (5) Protected time (2) Workplace violence (2)	93
Excessive workload (12)	Clinic (2) Administrative burden (3) General (7)	90
Extrinsic motivation (12)	Relative value units (4) Monetary (2) Non-monetary (6)	93
Values and expectations (5)	Values and expectations (5)	91
Patient factors (7)	Patient factors (7)	95
Physical space (4)	Physical space (4)	97
Interruptions and distractions (5)	Nurses paging (2) Patient logistics center paging (2) General (1)	93
Moral distress (2)	Moral distress (2)	89

The number of breakdowns for each main theme and subtheme is provided in parentheses (#).
ED, emergency department; ISCU, intermediate surgical care unit; OR, operating room; SICU, surgical intensive care unit.

Table 3 Key stressors and subthemes for work system stressors captured in the non-faculty (APPs, nurses, and staff) affinity model

Stressor (#)	Subthemes (#) within each stressor	Percentage (%) of non-faculty in agreement after validation
Inefficient workflows (25)	Clinic schedule (7) Clinic front office (3) Reduced time (2) Pre-authorization (3) Wound care (2) Admin (2) Other services (3) General (3)	86
Technology (27)	Electronic health record system (20) Paging/Calls (5) IT support (2)	71
Organizational culture (26)	*Leadership* Nursing leadership (2) APP leadership (3) Division (3) System leadership (5)	82
	Relationship(s) (4)	
	Communication (9)	
Inadequate staffing (20)	APPs (4) Nursing and admin staff (6) Clinic (3) Labs/Other areas (1) General (6)	96
Organizational support (13)	Training (9) Dedicated time for quality improvement (2) General lack of support (2)	93
Excessive workload (11)	Job roles (4) Work-life integration (1) General (6)	81
Extrinsic motivation (9)	Monetary (5) Non-monetary (4)	82
Values and expectations (6)	Values and expectations (6)	98
Patient factors (5)	Patient factors (5)	88
Physical space (4)	Physical space (4)	88
Interruptions and distractions (2)	Interruptions and distractions (2)	75

APP, advanced practice provider.

Systems-analysis approach

A systems-analysis approach allowed the researchers to holistically assess the system by integrating stakeholders and their goals, activities, technologies, and environments into the research process. This study specifically used a contextual design approach developed by Holtzblatt and Beyer[12] to collect, analyze, and use the data to create a model of stressors related to burnout that were validated and prioritized by participants. Similar to other studies that have shown the use of a systems-analysis approach results can guide initiatives that result in significant improvement to patient and service outcomes,[17] our study demonstrates a systems-analysis approach is feasible for understanding burnout and associated stressors.

By conducting this work in a sequential order (surveys, followed by focus groups, then CIs), the research team gained a high-level overview of stressors contributing to burnout. Specifically, focus groups added more context for key stressors than surveys alone were able to provide, focusing on problems in the current system as a whole in a small group setting. CIs provided an opportunity for observations in attending faculty and non-faculty settings, and for participants to share individual insights that were not covered by the survey or focus groups and elaborate on stressors. Our approach assessed stressors holistically and identified specific priorities for targeted improvement by team members themselves, generating a prioritized list of actions by their perceived levels of impact and effort.

Our comprehensive approach provides a deeper understanding of participants' priorities and underlying stressors contributing to burnout than what could have been uncovered through only one method. Prior work in this area predominantly used surveys alone.[3 5 7 18] Our focus groups and CIs provided significantly more contextual information to the open text response section of our survey, and provided insights into why particular stressors had been rated most severe or high priority on the survey. For example, focus groups and CIs revealed how patient flow and managing various other workflows led to added time spent on a task or an abrupt rearrangement of schedule. CIs in the OR, floor, ICU, and clinic uncovered workarounds used by acute care and trauma surgery team members for computers and electronic health record issues.

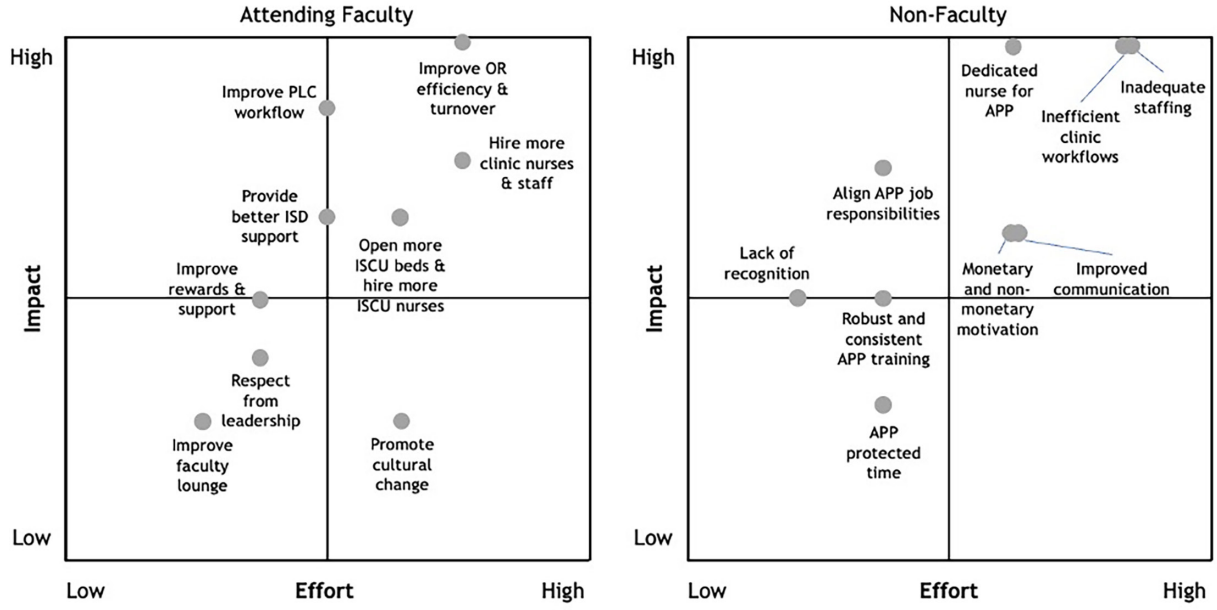

Figure 1 Level of effort versus level of impact matrix based on prioritizations from attending faculty. APP, advanced practice provider; ISCU, intermediate surgical care unit; OR, operating room; PLC, patient logistic center.

Our methods can be readily applied elsewhere. Our methods of data collection were easily adopted from the insights provided by Goodacre *et al*.[14] Our methods for analysis of the MBI and well-being data were based on the work by Li-Sauerwine *et al*[15] and NAM.[8] In addition to this work, we have successfully used these same methods among hospitalists.[13] Other investigators seeking to do similar work can readily apply these methods as detailed here and elsewhere.[13 14]

Burnout

Results from this study demonstrated elevated levels of burnout (74%), mean EE (3.21), and mean DP (2.26), which are higher than what has been reported by others in similar settings; with burnout rates ranging between ≈35% and 60%.[3 18 19] The higher burnout levels could partly result from our study being conducted during the COVID-19 pandemic between February and April 2022, after the identification of several new COVID-19 strains at the beginning of 2022, vs the previous burnout studies[3 18 19] conducted pre-COVID-19. Furthermore, a few stressors contributing to burnout and related priorities for improvement were in part impacted by the COVID-19 pandemic; for example, initiatives to improve throughput and patient flow were instigated by an influx of acute patients during this time period, along with associated feelings of wanting more recognition from leadership for working through this influx. Other studies noted similarly increased levels of burnout among trauma surgeons during COVID-19, which exacerbated burnout among acute care and trauma surgery teams.[5 6] These studies note patient safety and employee turnover implications of burnout among acute care and trauma surgery teams during COVID-19. Our work expands on this by demonstrating the multifaceted nature of stressors contributing to burnout that extend beyond the COVID-19 pandemic, and providing a comprehensive approach to evaluate burnout that can be replicated in a postpandemic setting. The

Table 4 Participant-generated summary of high-impact, low-effort priorities and descriptions for acute care and trauma surgery attending faculty and non-faculty

Participant group	Priority	Description
Attending faculty	Improve throughput and patient flow*	Reduce unnecessary pages and phone calls; improve patient logistics center triage.
	Provide better IT support*	More IT support; maintain computers. EHR support to create/update order sets. Streamline the OR, clinic processes, and documentation. Support through Epic Embedded Professionals needed; changes in Epic are difficult to implement and need approval by multiple committees.
	Improve rewards and support†	There needs to be better rewards/incentives for quality and performance in non-clinical roles. RVUs >150% are not rewarded with additional pay, which can be a disincentive to do more work; this 150% RVU ceiling should be removed. Support staff needed for teaching, administration, and documentation.
Non-faculty	Alignment of APP job responsibilities*	Broaden APP's responsibilities to enable them to practice at the full extent of their license.
	Lack of recognition from leadership†	Non-faculty do not feel valued and are not rewarded for the amount of work they do; hospital leadership needs to understand the importance and value of each role. There needs to be equity for faculty and staff across the hospital system.
	Robust and consistent APP training*	APPs need better training and education. APPs could be trained to do a lot more to use them to their full potential. APPs should have more robust and consistent procedural training.

*Localized priority for study's division.
†Generalizable to other acute care and trauma teams.
APP, advanced practice provider; EHR, electronic health record; IT, Information Technology; RVU, relative value unit.

results from our study add to the growing body of evidence that emphasizes the need to urgently address burnout among acute care and trauma surgery teams, and reiterate the call to action in addressing this issue.

Severity and priority of stressors

Stressors captured within our affinity model were consistent with the key contributors to burnout noted in other studies among acute care and trauma surgery teams (eg, inefficient workflows, work environment/work conditions, unmanageable workloads, lack of adequate training, compensation, and acuity of care).[3 18 20 21] These studies largely observed that work conditions, patient acuity, workload, and other related stressors all significantly impacted burnout, stress, and job satisfaction among acute care and trauma surgery professionals. These and our findings highlight the importance of addressing key stressors such as inefficient workflows, excessive workload, and organizational culture. Regarding generalizability, a sizable fraction of the 18 distinct priorities (6/9 for attending faculty and 4/9 for non-faculty) that were identified and rated by level of impact and level of effort (figure 1) appear to be generalizable to other acute care and trauma teams.

While many of the stressors captured within our study were similar to those previously reported, several stressors identified were unique to our study's affinity models for attending faculty and non-faculty. For example, the throughput/patient and IT workflows and support were categorized as high-impact, low-effort priorities for attending faculty, and alignment of APP job responsibilities was a priority for non-faculty. These stressors (eg, patient/IT workflows) could be a reflection of specific workflows within our medical center, and thus perhaps not generalizable. Nevertheless, studies outside of acute care and trauma have noted the importance of organized patient and IT workflows to reduce healthcare professionals' stress and the development of burnout,[22 23] thus corroborating our findings in this area.

Results from our study suggest that the majority of stressors perceived as the highest severity and priority are job *demands* (eg, inadequate staffing, inefficient workflows, excessive workload, interruptions and distractions) rather than job *resources* (eg, job autonomy, support, rewards) as categorized by the NAM model.[8] The results from our work are similar to those of studies that have used the job demands and resources model to evaluate the impact of work systems on healthcare professionals' burnout.[24–26] These studies as well as our study observed an interconnectedness (or even possibly a mutually reinforcing relationship) between several of the stressors across job demands and job resources. For example, many of the qualitative responses from the focus groups and CIs noted that inadequate staffing, the top-rated stressor, and inefficient workflows, such as with the throughput and patient flow or IT departments, often led to excessive workload. This, in turn, led to the desire for more recognition, support, and compensation for the excess workload during COVID-19. These associations suggest that some of the categorization of stressor types may be somewhat imprecise and/or arbitrary. Furthermore, these studies and our study align with the NAM report,[8] which concludes that balanced or optimal job demands and resources enhances professional well-being, while unbalanced or less than optimal job demands and resources can predispose healthcare professionals to burnout. Decisions made at multiple system levels (external, organization, and at frontline care units) all have an impact on the job demands and resources that acute care and trauma care professionals experience.[8] Ultimately, the generated prioritized list of actions suggest that acute care and trauma surgery care teams need interventions that allow them to do their job efficiently and effectively.

Limitations

Our study was limited to one acute care and trauma surgery care team at one US academic medical center. This allowed the stressors within the division to be comprehensively and exhaustively explored. However, the identified stressors are relevant only within context of this study and cannot be generalized without a larger sample size from multiple institutions and further research with a wider range of contexts. It is possible that aggregated data across multiple institutions using a similar systems approach to identify stressors in other divisions or in other acute care and trauma settings could be useful to investigate demographic trends or prevalent stressors across multiple contexts. The modest number of participants was expected as we wanted to focus on the stressors impacting the attending faculty and non-faculty within the division. Nevertheless, 19 is a relatively large sample size given the extent of our assessments, and this represents over 90% of the acute care and trauma surgery division. Furthermore, the sample of our acute care and trauma surgery division is somewhat representative of academic medical centers in the USA. While other studies assessing burnout among surgery professionals[3 5 7] had a larger population to sample from, and thus more participants, our study had greater participation rates. Additionally, stressors related to burnout were exhaustively explored with this group of participants from the diversity in methods used. Many of the priorities noted in our study (eg, excessive workload, inadequate staffing, organizational culture) have been noted by others in both the acute care and trauma setting[3 18 20 21] and in other settings,[24 25] supporting the validity of our approach, and the generalizability of our findings.

While participants were given the opportunity to respond anonymously on the survey and provide their individual thoughts and feedback during the CIs and prioritization sessions, there was potential for bias due to possible information sharing between participants potentially influencing responses. Additionally, there was potential for observer bias during CIs, which the research team mitigated by upholding principles of contextual design that emphasize partnership, connection, and identity[12] and reviewing research team notes with the participant at the end of each CI to ensure all information was captured accurately. There was also the potential for participant fatigue across our broad methods, which has the potential to impact response quality. To counterbalance potential participant fatigue, we ensured buy-in from division leadership and clinic coordinators before initiating the work to provide protected time for completing each component of the study, spread the different phases of our study (survey, focus groups, contextual inquiries, validation and prioritization sessions, impact/effort rating) over a period of 3 months (February to April 2022), and maintained constant communication with participants in the form of appreciation emails and thank you notes. Additionally, while our affinity models and impact/effort ratings were stratified by faculty and non-faculty, we could not further stratify the non-faculty group (APPs, nurses, staff) due to small numbers. Nevertheless, our study used a participatory, data-driven, and systems-analysis approach to identify six recommendations for improvement that appears to be one of the first and largest of its kind in our field.

CONCLUSION

A contextual design approach to studying burnout using surveys, focus groups, CI, modeling, and validation and prioritization is a

feasible method for identifying key stressors and improvements among acute care and trauma surgery care teams. Survey data demonstrated high levels of burnout among attending faculty, APPs, nurses, and staff. Six recommendations (three specific to attending faculty and three specific to non-faculty) for improvement based on participants' perceived level of impact and level of effort were provided to leadership for consideration, and several specific improvement actions have been taken and are in progress (online supplemental materials 5). These results warrant further studies with larger sample sizes, implementation-effectiveness research, and systems-focused interventions.

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