

How Surgical Residents Spend Their Training Time

The Effect of a Goal-Oriented Work Style on Efficiency and Work Satisfaction

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Hypothesis: When work hours are limited, improving residents' work efficiency allows more time for key training activities, reduces frustration, and improves work satisfaction.

Design: Prospective control study.

Setting: General surgical service with a trauma program.

Participants: Five full-time attending physicians, a resident team of 9 members, and 3 surgical assistants.

Intervention: Reorganization of work habits based on a goal-oriented work style.

Main Outcome Measures: Changes of time spent in key activities; punctuality for operations, clinics, and con-

ferences; residents' work satisfaction, physical fatigue, and mental stress; and attending physician and patient evaluations of residents.

Results: A goal-oriented work style reduced round time and nonpurposeful time and improved punctuality for key education activities. More operative time could be accommodated within the work-hours limits. Residents' work satisfaction improved while mental stress was reduced. Patient satisfaction scores also increased.

Conclusions: Residents' work is generally inefficient. Reduced work hours should be accompanied by work-habit reform to make the best use of residents' training time.

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SINCE JULY 2003, ACCREDITED residency training programs in the United States have universally implemented the rule of limited duty hours. While the change in form is dramatic, its effect on the substance of training programs is still unknown, prompting the formation of the Committee on Learning Environment by the Accreditation Council for Graduate Medical Education (ACGME) to study the impact of limited duty hours and to innovate.¹ Given limited hours, 2 basic tenets seem self-evident: (1) operational efficiency of trainees' working and learning must be maximized to make the best use of precious training time and (2) key ingredients of training programs must be safeguarded if the quality of the nation's training is to be maintained. In this study, we prospectively examined the operational efficiency of the resident by collecting baseline data on time spent on training activities in a busy surgical service and determined the effect of intervention with an efficiency engineering tool on objective and subjective outcome measures, including time for key activities and work satisfaction.

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METHOD

The study was conducted in the setting of a general surgical service with a level II trauma program, running an average daily census of 33 ± 5 patients (mean \pm SD) (n = 480 days of census), staffed by 5 full-time attending physicians, a resident team of 9 members (1 fifth-year resident, 2 fourth-year residents, 1 second-year resident, and 5 first-year residents), and 3 surgical assistants. Trauma as an integrated service

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contributed substantially to the work load, with about 1100 trauma admissions per year, 34% of which were penetrating. Over 2 full academic years, residents kept a log of their daily activities (weekdays) to the nearest 30 minutes, categorized under the following: morning and evening rounds, performing/assisting operations, direct bedside patient care, admitting and discharging patients, and attending trauma alerts, outpatient clinics, teaching conferences, and journal clubs. A miscellaneous box was used for time not appropriate for any of the categories, including downtime. The data were entered weekly in an Excel spreadsheet posted on the department Web site accessible

Table 1. Average Time Spent in Various Training Activities by Junior and Senior Residents in a Workday Before and After Reorganization

	Mean \pm SD, h/d (n = 240 d)				P Value	
	Before Reorganization		After Reorganization			
	Junior Residents	Senior Residents	Junior Residents	Senior Residents	Junior Residents	Senior Residents
Morning rounds	3.8 \pm 0	3.6 \pm 0.2	1.6 \pm 0	1.3 \pm 0.1	<.001	<.001
Performing/assisting operations	0.2 \pm 0	3 \pm 0.2	1.5 \pm 0	5.4 \pm 0.4	<.001	<.001
Outpatient clinics	2 \pm 0	1 \pm 0	2 \pm 0	2 \pm 0	.26	.22
Admitting/discharging patients	1 \pm 0	0.6 \pm 0	1 \pm 0.1	0.4 \pm 0.1	.31	.14
Direct bedside care	2 \pm 0.2	1 \pm 1	2 \pm 0.1	2 \pm 0.4	.49	.51
Attending conferences	0.4 \pm 0	0.7 \pm 0	1 \pm 0	1 \pm 0	.21	.16
Evening rounds	2 \pm 0.3	2 \pm 0.3	1 \pm 0	1 \pm 0.1	.14	.12
Attending trauma alerts	1.6 \pm 1	1.6 \pm 0.4	1.4 \pm 1	1.6 \pm 0.5	.46	.41
Miscellaneous*	2 \pm 1	1 \pm 0.2	0.6 \pm 0	0 \pm 0	.047	.01
Total†	15 \pm 1.6	14.6 \pm 1.1	12.6 \pm 0.1	14.4 \pm 0.7	.32	.43

*Time not appropriate for any of the categories, including downtime.

†Totals are calculated from individual data and may be slightly different from adding the means because of rounding.

to residents. Ninety-eight percent compliance was attained, since it was monitored and audited frequently by us (R.S.C. and N.A.). After 1 year, analysis of the data established that the most time-consuming activities were the morning and the evening rounds, typical of other surgical services. Since the morning round holds the key to organizing the rest of the day's activities, we began with reorganizing the morning rounds. We then applied the same principle to reorganize outpatient clinics, conferences, self-study, and all other applicable training activities. The second-year data were compared with the first-year data.

GOAL-ORIENTED WORK STYLE

The principle of the work style is to set main objectives of each activity and not to lose sight of the objectives in the execution. Morning rounds illustrate well the application of this approach. Three goals were set for the morning rounds: detect postoperative complications early or conduct orderly preoperative workup; inform patients of the agenda for the day; and answer patient questions and complaints. Laboratory/radiology results were reviewed immediately before rounds and care planning, after rounds. The team had assigned roles as follows: the chief (fifth- and/or fourth-year residents) had main contact with the patients, assisted by the junior residents, one of whom (the scribe) recorded progress notes and made a work list. The rest of the team (unobtrusive but within earshot) helped with these tasks, such as entering orders, aiming to complete the rounds in 1 hour. With such rounds, team continuity of care was built in, reducing some problems of "sign-outs." Operational streamlining was applied to outpatient clinics so waiting by either patients or staff was minimized. Patients were seen by the attending physician and chief/senior residents and problems were identified for a stepwise solution over a planned number of visits, if more than 1 visit was needed. Return visits after operations were scheduled for the attending physician and residents involved in the operation. Different conferences were already goal oriented: the Morbidity and Mortality Conference aims to promote the discipline of objective analysis of the causes and management of complications; the Case Management Conference, treatment options and surgical judgment; the Tumor Conference, multidisciplinary roles and outcome; and so on. Even daily readings and study clubs were focused on patients at hand.

To initiate the reorganization, we (R.S.C. and N.A.) served as models for the chief residents and instructed the team on the explicit roles of the key players. The attending physician played the role of the chief resident, who watched closely and learned how to keep to the simple goals. Thereafter, on alternate days, the chief resident emulated the attending physician, who shadowed the resident and made necessary improvements, until the team's performance was deemed satisfactory. A similar modeling method was used in the outpatient clinics and the teaching conferences.

OUTCOME MEASURES

The data analyzed included weekly work hours, punctuality in the operating room and at conferences, miscellaneous time, number of operations performed, and subjective evaluations by attending physicians of the performance in organization and pertinent core competencies (see "Results" section). We also surveyed the residents' self-assessment in work satisfaction, physical fatigue, and mental frustration/stress. Patient satisfaction, a vendor-conducted survey reported quarterly to the hospital, which includes the patient's overall opinion of residents, was compared before and after reorganization.

STATISTICAL ANALYSIS

Using a statistical program (SigmaStat for Windows, version 2.0; SPSS, Chicago, Ill), analysis of variance was performed followed by null hypothesis testing using paired *t* tests for normally distributed data and the Mann-Williamson test for data not normally distributed. Significance was set at 95% confidence level.

RESULTS

Time consumption for various activities before and after goal-oriented reorganization is listed in **Table 1**. The largest blocks of time before reorganization were taken up by rounds, especially morning rounds. Reorganization had the most noticeable impact on round times, but improvement was also seen in outpatient clinics, and there was an increase in time spent in operations for both jun-

Table 2. Effect of Efficiency Engineering on Outcome Measures

	Mean ± SD		P Value
	Before Reorganization	After Reorganization	
Work hours/wk (n = 48 wk)	82 ± 9	80 ± 2	.37
On-time attendance, % (n = 240 d)			
Conferences	42 ± 8	92 ± 8	.001
Operating room	67 ± 11	98 ± 1	.001
Clinics	58 ± 12	81 ± 5	.01
Operations/wk per resident	2.6 ± 0	4.9 ± 1	.001
Survey score (range, 1-10; 10 best)			
Residents' survey (n = 16 residents)			
Work satisfaction	4 ± 1	8 ± 1	.001
Physical fatigue	6 ± 1	7 ± 1	.11
Frustration/stress	3 ± 1	8 ± 1	.001
Attending physicians' survey (n = 15 attending physicians)			
Punctuality	3 ± 2	7 ± 1	.001
Professionalism	4 ± 2	7 ± 1	.01
Communication	4	8	.01
Patients' survey	5	8	NA

Abbreviation: NA, not applicable.

ior and senior residents. Miscellaneous time was all but eliminated because residents did not have nonpurposeful work in the hospital. Since total work hours per week remained unchanged, the net effect was a shift of time use from rounds to the operating room, reflected by an increase of operations performed by both the junior and senior residents. **Table 2** lists the effect on outcome parameters. Punctuality at conferences, operations, and clinics all improved. The organized rounds contributed to an unforeseen benefit of improved professionalism and communication skills with patients, as evaluated subjectively by attending physicians. The resident survey showed strong scores for improved work satisfaction and reduced work-related stress and frustration due to perceived waste of time. Patient satisfaction appeared improved but statistical analysis was not possible because the vendor's methods and raw data were unavailable.

COMMENT

The workaday life of a surgical resident in a modern hospital presents a major challenge in operational management. Junior residents spend the day performing a myriad of apparently aimless tasks with little sense of accomplishment; senior residents often relegate inappropriately or worse, do all the work themselves with even less efficiency. Our baseline data, as well as other data,^{2,3} suggested that much of the work done by residents is aimless and noneducational, disparagingly referred to as "scud." A hallmark of disorganized teamwork is excessive time spent on rounds, as shown in our baseline data. To address this directly, one solution is to effect a change in work habit to one where all types of work have achievable objectives, rendering the time spent more productive and satisfying, the basic principle of a goal-oriented work style. More significantly, the work style organizes the time management of the entire team, and since the objectives are shared, con-

stant communication and updating follows naturally, a key safeguard of patient safety.

Although increased efficiency was not reflected in shorter hours, it resulted in more time for key training activities, such as operations, which led to better work satisfaction. From the residents' perspective, the improvement in teamwork and the consequent reduction in moral conflict and emotional stress had a greater impact on well-being than physical fatigue.

Even though the key elements of surgical training have been detailed in the program accreditation requirements,⁴ their relative importance has not been ranked, presumably because they are all equally important. However, one readily quantifiable element is the resident's operative experience and the time required in acquiring this experience.⁵ We believe, as do others,^{4,6} that operative skill is what uniquely separates surgical from nonsurgical specialties and must remain one of the primary goals for training surgeons. Indeed, several Residency Review Committees have begun developing framework to evaluate "procedural competence" in their respective specialties.⁷ The goal of protecting operating time provides powerful motivation for the residents to improve their work efficiency.

While physical fatigue and sleep deprivation have received national attention as a cause of medical errors,⁸⁻¹⁰ often compared with tired truck drivers incurring more accidents,⁸ moral conflict with sense of duty and frustration from perceived time waste went largely unstudied, even though its existence has been documented for many years.^{6,11,12} Restricting hours alone without regard to program content may escalate frustration and mental distress, already prominent traits of surgical residents,¹¹ and may adversely affect patient care. The data in this study support the contention that reduced work hours must go hand in hand with improved operational efficiency, otherwise the gain from better physical rest may not make up for a more frustrated work life.

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Invited Critique

Wasted time is the scourge of surgical residency. Prior to the days of restricted work hours there was no concern for how surgical residents' time was used. Consequently, we evolved abusive systems that consumed the entire life activities of our trainees in the name of "learning" patient care. Fatigue resulted from never-ending work details, resulting in medical errors that society found unacceptable. Responding to external pressure, training program certification bodies imposed work-hours restrictions. Collectively, our initial reaction was to grouse. We believed that surgeons could not learn how to care for patients with these limitations. Half-heartedly, program directors reorganized surgical services in an attempt to meet these new requirements. Few have met the challenge to fundamentally restructure the way we conduct business.

The study by Chung and Ahmed represents an important consideration in rethinking how we should provide education in the necessarily apprentice-type learning environment of surgical training. We teach residents to do the things we do by having them follow us around and learn by doing. This works well for technical surgical skills. Along the way we teach them the knowledge base for surgery and matters of judgment that are such an important part of being a surgeon. What we ignore is how we organize our day or the mechanics of the mundane tasks that must be performed on a daily basis. It is this latter task that Chung and Ahmed address. In their study, residents were asked to document how they spend their time. Following an intervention regarding rounds efficiency, time logs were repeated. The findings were striking. Residents were spending 3 to 4 hours per day rounding. Following successful intervention, this was reduced to about 1.5 hours.

Chung and Ahmed have provided a call to action for all of us who teach surgical residents. Introspection is needed with self-assessment of mechanisms we use to organize our activities. Attention to the processes we use for decision making is necessary. How much information do we require before we make decisions? How do we assess and accept risk when decisions are made quickly or with less than desirable amounts of information? Details of time and team management have not been emphasized in the past and certainly have not been incorporated into surgical curricula. Changes in the structure of surgical residency have forced a new approach to teaching, mandating that we provide formal guidance to our trainees in these concepts. Of course, that is only after we figure it out for ourselves first. . . .

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