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How Interns Spend their Time: A Time-Motion Study at Yale New Haven Hospital

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**HOW INTERNS SPEND THEIR TIME:
A TIME-MOTION STUDY AT YALE NEW HAVEN
HOSPITAL**

**A Thesis Submitted to the
Yale University School of Medicine
in Partial Fulfillment of the Requirements for the
Degree of Doctor of Medicine**

**by
Oliver Rothschild**

2009

Abstract

HOW INTERNS SPEND THEIR TIME: A TIME-MOTION STUDY AT YALE NEW HAVEN HOSPITAL. Oliver Rothschild (Sponsored by John Moriarty).

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The goal of this research is to evaluate the effects of placing a clerical assistant on an inpatient internal medicine housestaff team and to identify segments of intern work that are perceived by interns as of particularly high or low value for patient care and education. Data was collected through a time-motion study, following six interns over six days, recording their activities, with whom they spent their time, and how valuable they found each activity to their patients and to their own educations. Compared to interns on teams without a clerical assistant, interns on teams with a clerical assistant spent more time in educational activities (27.5% of their time vs. 19.1% of their time) and less time on the phone (7.2% of their time vs. 14.9% of their time). In addition, direct patient care was consistently rated as high value for patients (4.81 ± 0.12 out of 5) and educational activities were rated as high value for education (3.83 ± 0.60 out of 5). However, much more time was spent by interns on indirect patient care (251.67 ± 48.75 minutes) compared with either educational activities (163.33 ± 57.85 minutes) or patient care (50 ± 21.91 minutes). In conclusion, our study found that interns spend a large proportion of their time in activities that are not directly related to patient care or education and that clerical assistants can

assume some of the non-clinical activities interns currently assume. Assumption of these duties by a clerical assistant however, does not necessarily increase direct patient care and education of interns implying that other barriers need to be identified and addressed.

Acknowledgements

I would like to thank everyone who helped edit this thesis. Dr. John Moriarty was supportive and helpful during the entire process, from framing the question, to collecting the data, to writing this paper. I would also like to thank the Yale Department of Internal Medicine Interns and Residents, who were supportive and friendly as I followed them, despite their incredible workload. Finally, I would like to thank the medical team assistant working with the Peters and Fitkin teams, who has worked tirelessly over the past year supporting interns and residents.

All errors and omissions in this paper are my own.

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Introduction

“Probably every person connected with a training service has some ideas of how interns spend their time, and many of how they should.” (1)

In 1959, Payson et al. performed the first time motion study of interns, in which a group of medical students followed two interns at Yale New Haven Hospital (then called Grace New Haven) documenting how they spent their time. (1) As the authors imply, many hospital administrators, ward attendings, program directors, and other physicians have a much clearer idea of what housestaff should spend their time on than what they actually do. In order to design a successful residency program however, it is necessary to understand how far current practice is from the ideal. It is only once a program has identified the gaps in its current set-up that it can begin to improve.

In this context, the Internal Medicine Residency Program at Yale New Haven Hospital has been constantly working to improve. A large number of initiatives and experiments have been developed in this vein over the past few years. The research presented here is another step towards understanding where further initiatives may be most effective, as well as in evaluating some of the initiatives already undertaken.

The Purpose of a Residency Program

Administrators and program directors are often torn by the demands of the residents they supervise, the service needs of their institutions, the desires of their faculties, the demands of their patients, and the guidelines produced by regulatory boards. While serving this diverse set of stakeholders, in essence, a residency program has two major goals: to train physicians capable of functioning as independent practitioners, and to care for patients. (2) While work hours are one measure of how much training and patient care residents are engaged in, recent studies have identified the need to quantify not only how many hours residents work, but additionally, how much time they spend on education and patient care activities. (3) Balancing these two goals is challenging, and there are no firm guidelines for how programs should allocate their trainees' time.

On the other side of the equation, residency programs have costs and constraints. Not only is resident time in high demand, but the process of graduate medical education is an expensive one, and should be optimized to ensure efficient use of expenditures. (4) Currently graduate medical education is funded by Medicare, Medicaid, hospitals, medical schools, voluntary health organizations, and faculty practice plans, and each makes the case that others should fund the added expenses associated with cutting resident work hours. (5) This debate has become even more acute as Medicare has come under pressure to cut costs.

In the fifty years since Payson studied residents at Yale, much has changed. In the first week of Payson's study, the interns took overnight call Monday, Wednesday, Saturday, and Sunday and the first intern studied worked more than 96 hours. (1) Since then, a large number of work-hour reforms have taken place, regulating hours worked by residents per week, number of admissions, number of patients on service, and consecutive hours worked without sleep or time off. (6) Again in 2008, work hour reforms were pushed forward by an Institute of Medicine report citing research demonstrating that increased sleep results in more alertness and less fatigue. (7)

In many ways work-hour reform has been successful, but it has not been an unqualified success. One of the hopes of duty-hour reduction was that residents might be better able to learn. (6) But while work hour reductions have been shown to have a positive impact on housestaff quality of life, education and patient care are two areas where housestaff have reported a negative impact. (8-10) A number of studies found that workloads were in general redistributed rather than reduced, and while educational conferences were still scheduled at the same rate, work hour restrictions led to significant drops in attendance. (8, 9) With fewer resident hours, carrying additional patients was associated with decreased participation in educational activity. (11) In addition, patient satisfaction can be negatively impacted by the discontinuity and decreased time spent with patients brought about by work hour reductions. (12) This is not altogether surprising – if the same output is expected in terms of learning and

patient care, but the inputs are reduced, quality is bound to suffer. Finally, this is all occurring in a rapidly changing medical environment, where lengths of hospital stays are decreasing while the complexity of diagnostics and treatment are increasing.

Potential Solutions

The decreased number of resident hours, combined with the failures of the medical system throughout the country, has set up a difficult situation for residents. As Paul Batalden noted, “the health care system is broken and residents live in the cracks of the broken system. They are the glue that holds it together.” (13) In order to fix the situation, there are a variety of tactics that can be employed, but perhaps the two that have received the most attention are eliminating inefficiencies in housestaff work, and substituting the work of other medical team members for that of residents.

In late 2007 and early 2008, administrators at Yale New Haven Hospital set up a pilot project on two services attempting to substitute the work of a Medical Team Assistant (MTA) for that of residents. The idea behind the program was that many of the tasks performed by residents do not necessarily need a trained physician to perform them. Studies report a variety of data as far as what percentage of activities physicians perform that in fact a clerical worker could instead perform, but the most commonly cited study by Knickman et al.

estimates that 20% of house staff's activity could be done by non-physicians.

(15)

The need for such a system of support has been reported widely, as far back as an Austrian study in 1972, when a time motion study of three interns found that a disproportionate amount of their time was spent in clerical tasks. (16)

Systems of additional support for housestaff have been set up in a variety of settings, but rarely in Internal Medicine wards. Similar systems have been set up in Europe, but they have focused primarily on increased nursing support, as procedures such as IV insertion were taking up a large portion of junior doctors' time. (17, 18) One surgery program in the US hired eight "health technicians" with broad roles who were able to significantly reduce hours worked. (19)

Administrative support has been suggested as a remedy for the surfeit of clerical work in outpatient clinics as well. (20-22) Wipf et al. reported not only a decrease in time spent on administrative tasks, but better outcomes in terms of availability of patient records and better quality of patient care. While present in many specialties, the drain of clerical work is particularly acute in internal medicine residencies. Magnusson et al. reported that residents spend fully 13% more of their clinical time on documentation in internal medicine compared with emergency medicine. (23)

The pilot program at Yale in 2007 and 2008 installed a full-time clerical worker in the hospital ward working with two medical teams. The MTA would perform clerical tasks for the interns including calling physician offices, obtaining

outside records, arranging inpatient diagnostic procedures, coordinating care with social work and care coordination, and arranging for follow up visits as part of discharge planning. This pilot program was studied in early 2008.

The results of the pilot program studying the MTA at Yale were difficult to evaluate. The only statistically significant difference between the work of teams with the MTA and teams without the MTA was the amount of time spent on the phone by residents. This was not balanced by an increase in time with patients however. Thus while phone time was reduced, it is unclear if the MTA truly made housestaff more effective in patient care.

Although interventions that replace housestaff work with that of other health workers like this pilot program at Yale are one way to manage the shortage of resident time, another approach is to make housestaff hours more effective. This has not been attempted systematically yet at Yale. In order to do this, the first step is to do a thorough analysis of what housestaff currently spend their time on and evaluate how valuable each activity is for the two principle outputs of resident time: education and patient care. A large number of studies have attempted to analyze the work processes of residents have been carried out, often in response to similar changes in work hour recommendations. (24) Educational value of house staff activity has become a more thoroughly studied topic as program directors and administrators become more conscious of this fact and as resources become scarcer. (3, 10, 25)

While many studies have been done to record the time spent by doctors on different tasks, relatively few studies have combined the time study with a measure of the value of the activity. Most time studies that address the value of tasks performed rely on external observers or experts. (15, 26-28)

A year after the initial pilot study, we decided to do another evaluation of the Medical Team Assistant's effect on the work of housestaff on the wards. In this study we have captured in detail what interns spend their time on, and additionally, what tasks they find the most worthwhile in terms of both educational value for themselves and value to the patient. With this data, we will be able to confirm that the MTA is still effective in taking over some clerical work from interns, we will be able to assess the value of the work that the MTA is taking away from interns, we will identify the tasks that interns spend their time on that have little educational and patient care value so that we can work to eliminate them, and we will identify the tasks that interns spend their time on that are perceived as particularly valuable by interns so that we can optimize housestaff work around them. Finally, we hope to identify a number of potential future studies to undertake. The previous study was undertaken entirely by other investigators, but the current research project is entirely the work of Oliver Rothschild, author of this paper.

Statement of purpose: specific hypothesis and specific aims of the thesis

The hypothesis to be examined is that the work of the MTA will decrease the amount of time interns spend doing tasks with low educational and patient care value.

The aims of the thesis are two-fold: first, to evaluate the effect of the MTA on how interns spend their time; and secondly, to describe intern work and potentially identify segments of intern work that are perceived as either of particularly low value to the interns and their patients or particularly high value, in order to guide future pilot programs and investigation.

Methods

Subjects

The subjects of the study were six interns in the Yale Internal Medicine residency program, three on a team with a Medical Team Assistant, and three on a team without such support.

We chose interns to study for three reasons. The first is that the prior set of observations involving the Medical Team Assistant had been done at Yale on interns. As we wanted to compare and build off the previous data set, it was important to have comparable populations.

Secondly, we anticipated that the Medical Team Assistant would make the most significant impact on interns rather than other members of the medical team. It has been previously demonstrated that 19.2% of total housestaff time is spent carrying out activities that could be performed by a non-physician, and that for interns this was even more dramatic, with 26.6% of activity able to be performed by non-physicians. (15) Another time study of interns and residents showed that interns spent a great deal more time on documentation (19% of their days compared with 11.7% of the average resident day). (28)

Finally, interns are at a crucial stage of their education. The intern year provides a transition from student to professional physician. Protecting their educational time with support staff like the Team Assistant, and finding ways to

minimize the time they spend on activities that do not require the expertise of a physician are particularly critical in this light. The same study showed that interns spend far less time in educational settings than residents (38.4% of their time compared with 57.3% of residents' time). (28)

The data was collected over the course of a single month to avoid differences in intern training levels. It was assumed that as interns go through the year, they will become more skilled and the activities they spend their time on will change. The plan was to follow four entire medical teams of two interns each – two teams working with the Medical Team Assistant and two teams working without the Medical Team Assistant. One intern became ill near the end of the month so rather than waiting for the next month, we decided to eliminate one intern from each team. The goal of the study was a qualitative overview of the interns' work, and to collect data from the missing intern would have required continuing the data collection beyond a month, so rather than prolonging the study, data was analyzed only from the first six interns.

Choosing what data to collect

In order to understand both the effect of the Medical Team Assistant, as well as to get a broad view of how interns spend their time, it was necessary to collect three interrelated sets of data.

The first set was a comprehensive view of what activities take up interns' days. The initial step in capturing this was to come up with a mutually exclusive but collectively exhaustive list of activities. It was important to capture this data in a form that would allow a continuation of the previous research done at Yale, as well as allow for comparison with published data on the subject. This was done by referencing both the previous study done on Yale's Medical Team Assistant program, as well as the most careful list of activities developed by other authors. Dresselhaus et al. had done a particularly good job of cataloging activities and explaining them. (28) The resulting list of activities was as follows:

- Direct patient care, broken down into initial history and physicals, other examinations, procedures, and education and counseling;
- Indirect patient care, broken down into discussing patient issues, documentation, ordering and obtaining the results of tests, discharge planning, and reading literature about a patient;
- Education, broken down into work rounds, attending rounds, conferences and lectures, supervised direct patient care, and informal educational activity
- Personal time;
- And finally, Transit.

The context of these activities was also noted for comparison with the previous Yale data. The three specific contexts noted were activities at a computer, activities completed by phone, and activities performed with the Medical Team

Assistant. The decision to include work rounds in education rather than patient care was potentially controversial, but was based on the literature. (28)

The second group of data that was collected was association, or in other words, with whom each activity was performed. In order to collect this data, first a list of possible associations was made, referring again to Dresselhaus. The list of possible associations was as follows:

- Alone;
- Physicians and students, including housestaff, medical students, ward attendings, and other physicians;
- Patient and family, including both patient and family members;
- And finally, nurses and staff, including other health professionals, and nurses.

With this data, along with the activity data, an accurate picture of how each intern spent his or her time was possible to reconstruct.

The last group of data necessary for the study was an assessment of the value of each activity to the patient and to the intern's education. Each category was measured on a Likert Scale from one to five. In order to evaluate the quality of an activity, the intern was asked to describe how much he or she agreed with the statements, "this activity is valuable for the patients I am taking care of" and "this activity is valuable for my education." The intern was to describe his or her level of agreement on a five point scale, with one being strongly disagree, two

being disagree, three being neutral, four being agree, and five being strongly agree.

Data collection process

A variety of methods have been proposed for capturing physician activity, including diaries, self-recording, retrospective questionnaires, work sampling, and finally, one-on-one observation, or time motion studies.

Time diaries have been used in the literature to collect this information, however this method of capturing activities has the major risk of losing data accuracy because of biased or imperfect recall. (29)

One study by Gledhill et al. had house staff carry tape recorders for 24-hour periods to self-record their activity. (27) This method does require a great deal of work by the subjects of the research. Another study was set up to place automatic clocks around a hospital that were started and stopped by subjects as they moved from activity to activity. (30)

Retrospective surveys as well have been used in studies, but both limited responses (52% in one recent study) and incomplete surveys have been reported with this method. (31) Zahn et al. found in a pilot study that housestaff commonly overestimate the time they spend on teaching when surveyed later. (32) Oddone et al. demonstrated that house staff estimates of how they spend their workdays are significantly flawed. In particular, housestaff overestimated the amount of

time they spent in patient evaluation compared to the results of time sampling (29% compared with 17%), as well as educational activities – house staff estimated that they spent 8.4% of their time reading when in fact they spent 2.7%. (29)

One of the most common methods is time sampling, whereby with a statistically representative sample, researchers can estimate the total time spent by physicians on their daily tasks.

The work-sampling technique collects data at intervals of time. For example, data might be collected by determining exactly what a worker is doing four times each hour. Sometimes the data are collected by observing the worker in action at the point in time selected for the observation. In other studies the workers use logs to self-report their activity. In some cases the intervals between observations are of fixed duration. In other cases the observations occur at randomly chosen moments in time. Typically, an inference is made about the portion of overall work time spent on an activity, based on the percent of observations that relate to that activity. (33)

Perhaps the most successful method developed for large-scale physician time sampling was through so-called “pager-based activity sampling” used by Brock et al. in 1990. (34) This group of researchers used telephone-activated electronic pagers or beepers to notify subjects when it is time for them to record their current activity. This type of system is particularly useful for studying a large group of physicians to get a picture in broad strokes of what their primary activities are.

For a more fine-grained picture, or when working with a small group of subjects, one-on-one recordings are still ideal. Finkler et al. demonstrated work sampling to be inaccurate by as much as 20% in one study comparing the two.

(33) That author also notes that to accurately sample (to estimate within 1% of the actual value) how much time a worker spends on a task that takes 1% of a worker's time; one would have to make as many as four million observations. If one can divide a worker's tasks into two or three primary categories however, work sampling is more attractive.

Many studies similar to our research have been conducted in this manner. In fact, in 1961, Payson et al. carried out one of the first such time and motion studies on physicians at Yale. Another similar study had two internal medicine house staff teams observed during 5 short call admitting days, followed by trained observers. (35) The activities of these residents were then compared with similar activities of house staff on night call.

Because of the increased accuracy as well as the small sample size, a time motion study was chosen as the optimal data-collection technique. Each intern was followed from 07:30 until 16:00 on call days only to standardize the interns' daily schedules.

This was in line with the team's previous work as well as with data published in the literature. (35, 28) These times were chosen to measure when the Medical Team Assistant was present as well as when additional clerical help could potentially be hired.

At each 10 minute interval, the observer would record both the primary activity that the intern had performed during the previous 10 minutes, as well as asking the intern for a Likert-scale rating of education and patient care.

One difficulty with collecting this data was getting accurate assessments of educational and patient care value. If a resident did a number of tasks in short succession, the more and less valuable tasks would be averaged to describe the previous 10 minutes. This would thus bring down the value of the more valuable tasks and bring up the value of the less valuable tasks. In order to circumvent this, only the primary activity for each 10-minute time period was recorded. This did run the risk however of missing common, short activities that might add up, such as short transport, looking for charts, and answering pages.

For patient confidentiality, interns were not followed into patient rooms to do histories and physicals. Instead house staff was asked to report on what they had spent their time on while in patient's rooms.

We did not build in any test of observer reliability, but as a medical student, the primary observer was deemed skilled enough to accurately capture the data. This is a potential weakness of the study.

Results

Figure 1: How interns spend their days

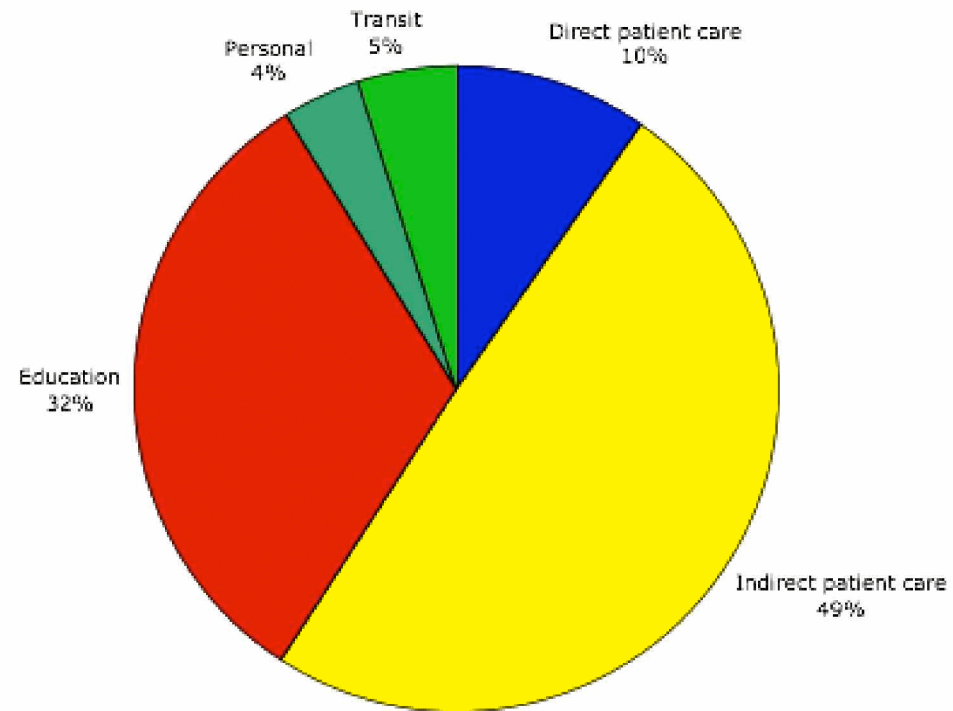


Figure 2: Value of Intern Activities

The size of each bubble represents the relative amount of time interns spent on each activity. Average patient care values are displayed on the Y-axis and average educational values are displayed on the X-axis. The same data is shown numerically in figure 3.

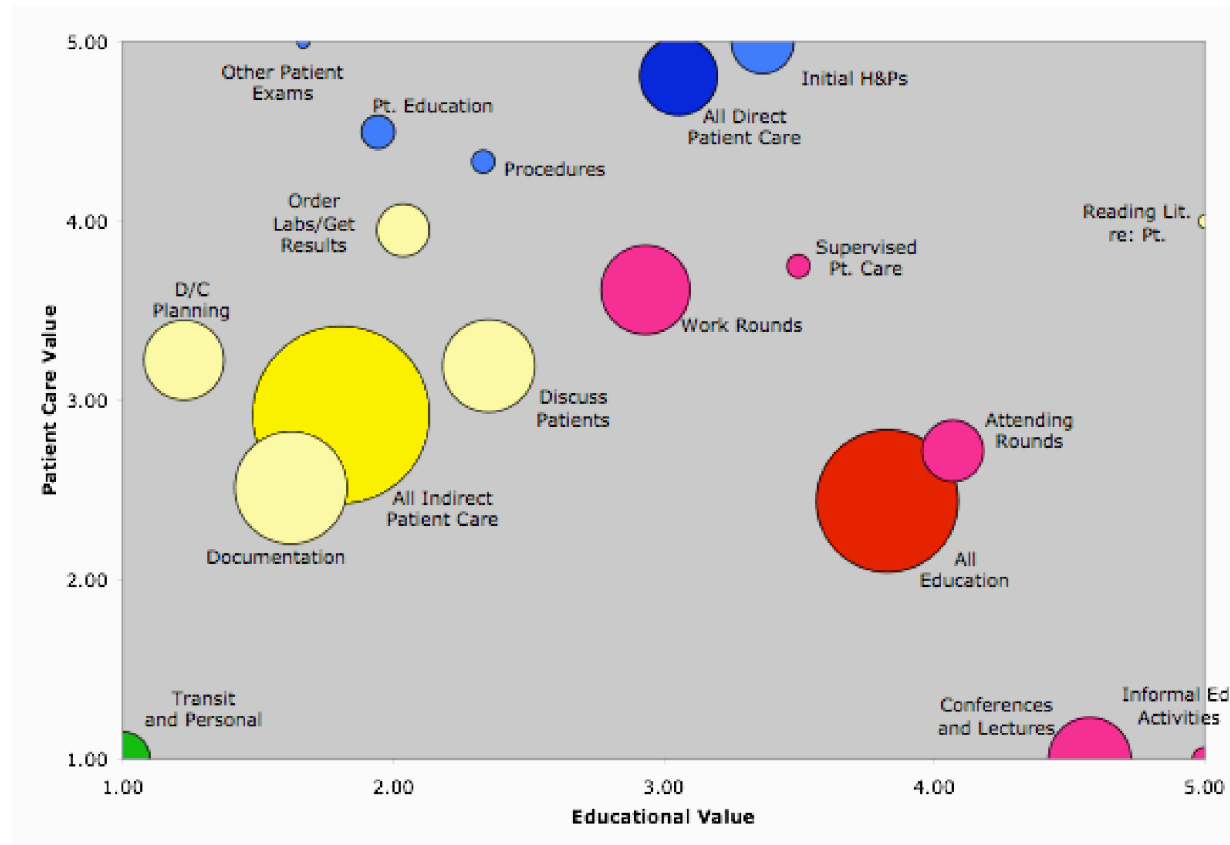


Figure 3: Value of Intern Activities

Activity	Time (min)	± S.D.	Edu. Value	± S.D.	Pt. Value	± S.D.
Indirect patient care	251.67	48.75	1.81	0.33	2.92	0.50
Documentation	103.33	32.66	1.62	0.42	2.51	0.82
Discuss patient issues	70.00	31.62	2.35	0.50	3.19	0.65
Discharge planning	53.33	52.41	1.23	0.26	3.22	0.74
Order/obtain results of tests	23.33	23.38	2.04	0.80	3.95	0.92
Reading literature re: patient	1.67	4.08	5.00	2.04	4.00	1.63
Education	163.33	57.85	3.83	0.60	2.44	0.38
Work rounds	65.00	32.71	2.93	0.77	3.62	0.72
Conferences & lectures	56.67	38.30	4.58	1.88	1.00	0.41
Attending rounds	31.67	24.83	4.07	1.96	2.72	2.01
Supervised direct pt. care	5.00	8.37	3.50	2.04	3.75	2.09
Informal educational activity	5.00	12.25	5.00	2.04	1.00	0.41
Direct patient care	50.00	21.91	3.06	0.95	4.81	0.12
Initial history & physical	33.33	22.51	3.37	1.05	5.00	0.00
Education and counseling	10.00	6.32	1.94	1.37	4.50	1.89
Perform/observe procedures	5.00	5.48	2.33	1.60	4.33	2.40
Other examinations	1.67	4.08	5.00	2.04	5.00	2.04
Transit	25.00	15.17	1.00	0.00	1.00	0.00
Personal	20.00	15.49	1.00	0.00	1.00	0.00

Figure 4: Average breakdown of interns' days by association

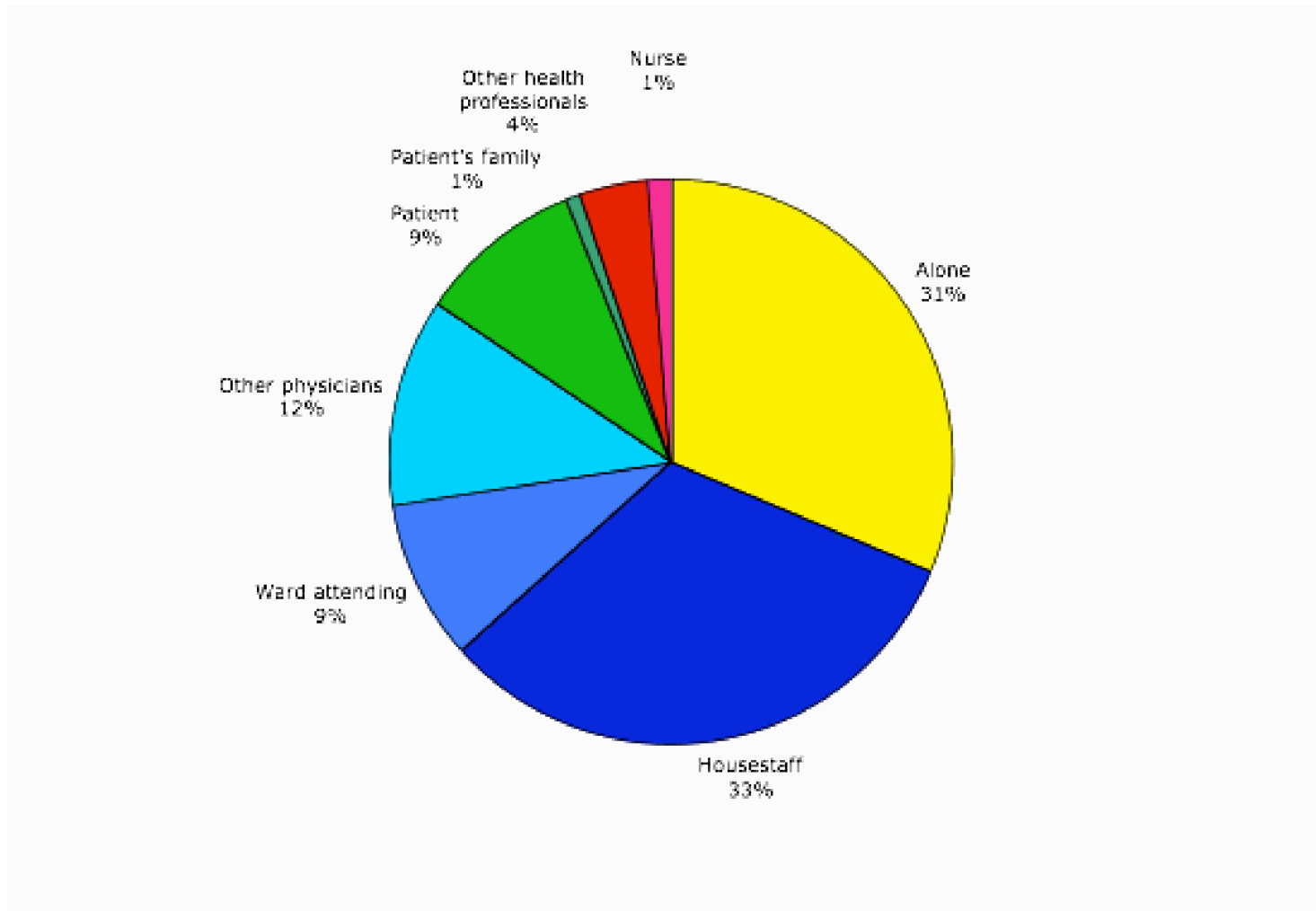


Figure 5: Value of Associations

The size of each bubble represents the relative amount of time interns spent on each activity. Average patient care values are displayed on the Y-axis and average educational values are displayed on the X-axis. The same data is shown numerically in figure 6.

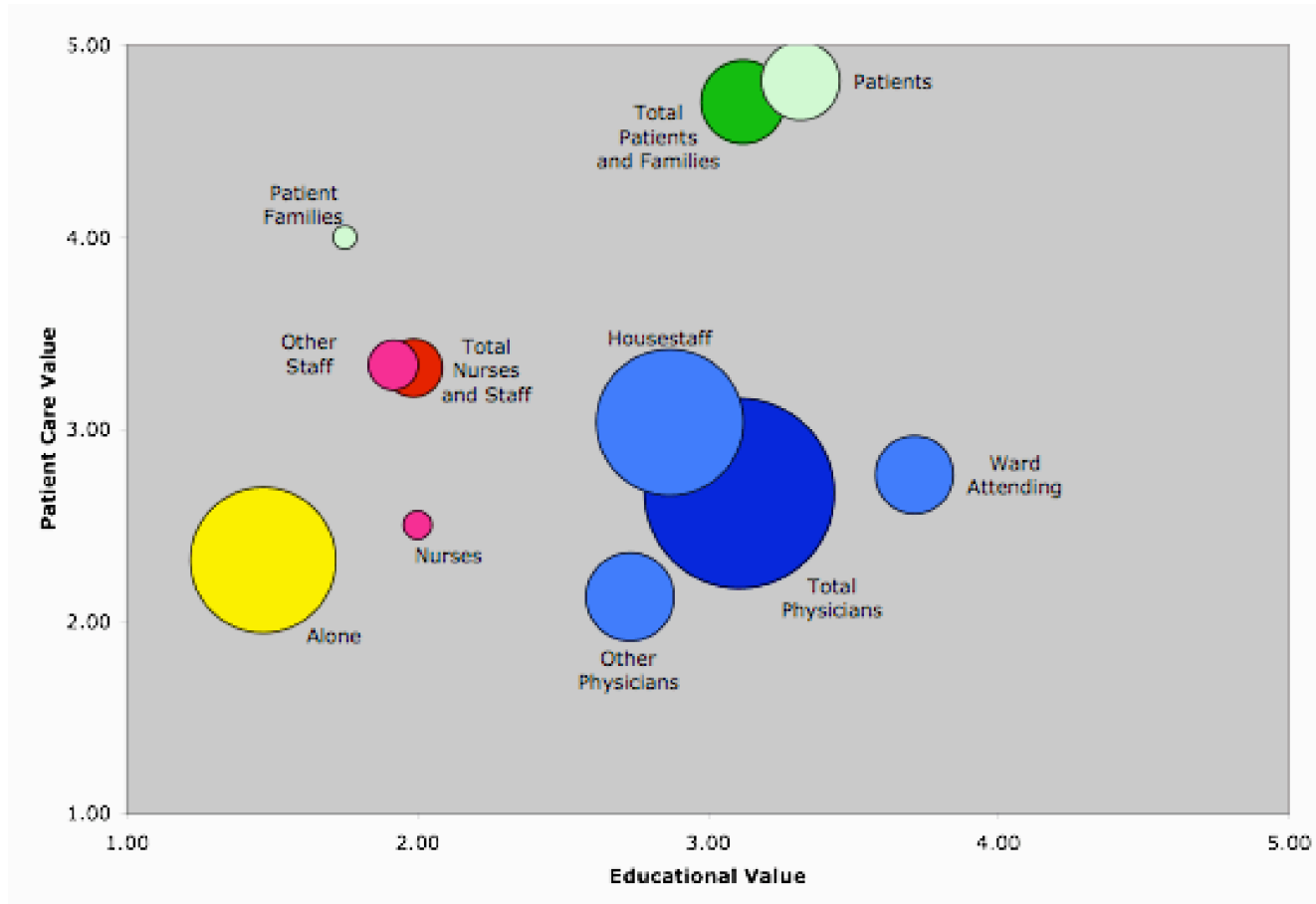
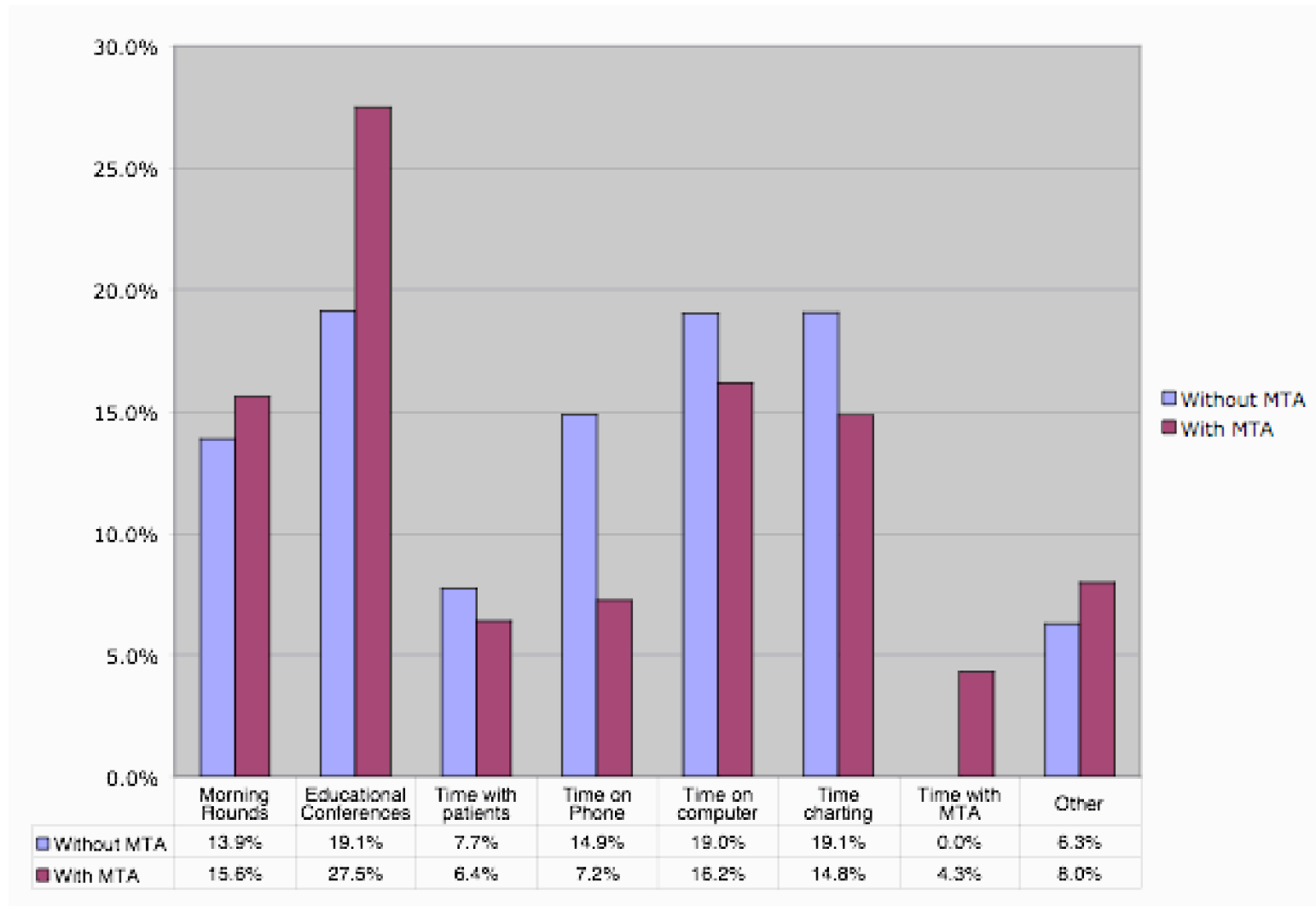


Figure 6: Value of Associations

Association	Time (min.)	<u>±</u> S.D.	Edu. Value	<u>±</u> S.D.	Pat. Value	<u>±</u> S.D.
Alone	160.00	57.27	1.47	0.29	2.32	0.66
Physicians	270.00	48.58	3.11	0.63	2.67	0.33
Housestaff	163.33	43.20	2.87	0.67	3.04	0.79
Ward attending	46.67	26.58	3.71	1.36	2.76	1.60
Other physicians	60.00	30.33	2.73	1.56	2.13	0.78
Patient and family	53.33	18.62	3.12	0.93	4.71	0.38
Patient	48.33	22.29	3.32	0.97	4.81	0.40
Patient's family	5.00	8.37	1.75	0.92	4.00	2.07
Nurses and staff	26.67	8.16	1.99	0.67	3.32	0.62
Other health professionals	20.00	6.32	1.92	1.07	3.33	1.08
Nurse	6.67	8.16	2.00	1.11	2.50	1.97

Figure 7: Comparison of teams with and without MTAs



Discussion

The Medical Team Assistant

Overall, the MTA program is still functioning similarly to when it was initially set up one year ago. When comparing the data collected here with the previous study, we see little change in the aggregate. Last year, the only statistically significant finding was that the interns with the MTA spent only 8.06% of their time on average on the phone compared to the team without the MTA who spent 15.57% of their time on the telephone. This year the overall trend is the same, with the MTA team's interns spending 5.88% of their time on the phone and the interns working without the MTA spending 13.73% of their time on the phone.

As was the case last year, the decreased time on the phone has not been converted to more time with patients. Instead, the replacement has been primarily with educational activities, time working on the computer, other indirect patient care activities, as well as personal time. However, it is notable that according to the data, time on the phone is one of the lowest rated activities in terms of education (1.51 ± 0.86), so any replacement of this time with educational time is a major success. Of course a portion of the time replaced was spent with the MTA.

The MTA did raise the amount of time spent on educational activities. While the goal of the study was not to demonstrate a statistically significant difference, this trend does bear further investigation. Many of the tasks that the medical team assistant has been assigned are those that are most cumbersome to the house staff's education. In one study, waiting on hold on the telephone, scheduling appointments and miscellaneous paper work were 3 of the top 5 most significant impediments to house staff education. (8)

Overall, the MTA program is felt to be somewhat successful right now. There are a number of challenges to overcome, but the potential for increasing housestaff effectiveness is enormous if the execution can be perfected.

Using the MTA

A number of issues prevent interns from working effectively with the MTA. The issues cited by Finn et al., a group at Harvard who carried out a similar pilot project, are applicable here: residents forgot about the program; residents felt it too time consuming; residents didn't trust the MTA to get things done; and finally, residents had trouble organizing their work to enable them to make use of the MTA. (14) While not part of the formal data collection, a number of interns followed in this research made comments about the MTA along the same lines.

There are a number of possible solutions to this problem. Finn et al. dealt with these issues in a few ways: by expanding the scope of the MTA's work, by

advertising the program more aggressively, by expanding the program to other services so that interns would get used to having the MTA, and by making a 1 hour turn-around time goal for requests. (14) These are all potentially applicable at Yale as well. One possible addition to this list would be to further integrate the medical team assistant into the team. During data collection, there were tasks that could theoretically have been accomplished by the medical team assistant, but instead were accomplished by the resident or intern because it would have taken too much time to find the medical team assistant, explain the sometimes complicated task, and then to wait for her to finish the task and return to let the resident know.

One issue noted during data collection is that the MTA at Yale did not round with the team, but rather just checked in early in the morning with the team and then returned to her office. When the MTA was initially hired, she had been asked to attend rounds, but it was later felt she could use her time better by working during those hours. If she was asked instead to attend all of work rounds with the team, she might be able to proactively take on tasks as they were raised by the team, rather than waiting in her office for the team to come to her with requests.

An innovation that the Harvard program has developed not yet in use at Yale is a system whereby the MTAs hold intern pagers while interns are in educational conferences. The MTA will record all pages, but additionally will ask the person paging whether they would like to pull the intern from conference.

This restricts the frequency of interns having educational conferences interrupted.

It is conceivable that the MTA could play a more active role in patient care as well. Many of the activities with high patient care ratings also have lower educational values, so would make sense to outsource them from interns. Particularly things like speaking with family members would be helpful. Perhaps the MTA could function as a go-between, serving to improve communication between patients and families, and the medical teams taking care of them. One study argues that an unskilled health worker could manage this interaction, as well as those with patients themselves. (15) Housestaff would continue to manage the important conversations, but the MTA could supplement these with more frequent communication.

One potential barrier to all delegation is that physicians consistently underestimate the amount of their work that can be delegated. In one study, housestaff categorized only 5% of their activities as appropriate for a non-physician to perform. (28) Often housestaff themselves do not see clearly what parts of their time could be easily delegated. In this same study, a full 40% of housestaff time was spent on documentation, testing, discharge planning, initiating consultations, and miscellaneous administrative tasks. To deal with this issue, the Harvard program has trained interns in which tasks are most easily delegated and reinforced this training repeatedly.

While a purely clerical MTA is one way to deal with the problem of an increasing squeeze on resident time, adding a midlevel-practitioner to manage the day-to-day changes in patient care is another model that has been suggested in the literature. (15) This model is typical of non-teaching hospitals, but could be adopted for use in a teaching hospital as well.

Cost

Another issue with replacing intern work with that of other healthcare workers is the cost. Podnos et al. cited the cost of a health technician as \$30,000 per year without benefits, while a surgical intern's salary was only \$33,000 in 2002, without benefits. (19) Not only do the surgical interns work twice as many hours as the health technicians though (80 hours a week compared to 40), but the substitution was also inefficient in this study, with 8 hours of health technician work only reducing intern labor by 2.5 hours. The same issue was cited in Finn et al., with a recorded cost of \$80,000 to fund two MTAs. (14) At Yale, the current cost of an MTA is \$38,000 per year, not including benefits. With 45 interns in the program, assuming 40 of them would be on service at a time, and assuming a constant rate of one MTA per four interns, scaling up the MTA program fully would cost \$380,000. An expense of this magnitude would demand further research before a hospital could adopt such a program wholesale.

In thinking about how to replace physicians in doing certain tasks, we must also be aware that many other medical professionals are in a shortage as well. In fact, some argue that the shortage of nurses may rival the shortage of physicians' time. (15) However, nurses and other medical professionals are available to work for their entire careers, while residents are available only for a few years before graduation.

A final concern in replacing a single intern's work with multiple staff is the increased number of handoffs of information. Already this has been cited as one of the principal problems created by the new work hour requirements. (36) If the replacement of intern work is to be effective and safe, systems must be carefully developed in order to ensure no data is lost.

How Interns Spend Their Time: Activities

While the sample size was relatively small, the overview of how interns spend their time was illuminating. The broad thing that stands out in both Figure 2 and Figure 5 is that the majority of intern time is spent on activities that are rated 3 (neutral) or less on both education and patient care scales (the bottom left of the chart). Activities that fall in the top right of the chart – activities that are of high value in both education and patient care are the smallest bubbles.

Direct Patient Care

“The finding that concerned us most was the small amount of time spent with patients. In planning the study we had no specific worries about the operation of these particular wards, no belief that patients were neglected and no hint that interns were not performing conscientiously and well. We regarded, and continued to regard, our teaching program as similar in philosophy, design and standards of performance to that at any other prominent university teaching hospital in the United States, and we rated and continue to rate our interns as a superior, select group. The problem, then, is to interpret the findings on patient care – that time spent with the patients did not vary with new admissions, that interns did not spend more time with their old patients on days when there were few or no admissions, that there was a remarkably rapid decrease in time spent with all patients after their first hospital day and that an old patient was seen less than ten minutes a day, unless there were acute medical complications. The doctor spent barely enough time with his patient to establish an acquaintance, much less a relation.” (1)

The preceding quote is from Payson et al.’s 1961 study of how interns at Yale spend their time. Their findings that “most of the time spent with each patient occurred during the first twenty-four hours in the hospital” was very similar to our data. In Payson’s study, less than ten minutes per day was spent with any single patient after the first forty-eight hours of admission. The total time spent during the ten days talking to patients and families during the ten days was 8.5 hours for one intern and 5.9 hours for the other. And this observation has been consistently noted consistently in studies ever since. Similar findings were reported in a similar study in California in 1971. (37)

What is striking about this quote in light of the data we collected is that after 50 years of noting that a relatively small amount of interns’ time is spent on direct patient care. With a positive rating for interns in education and the highest

rating in patient care, direct patient care is one of the most valuable activities an intern carries out. Initial history and physicals in particular were found to be enormously valuable for interns, but interns spent an average of only 33 minutes per day on this activity. And this finding is common in the literature - for example, one study found that a typical history and physical for a new patient took 25 minutes per patient during the day and 20 minutes at night. (35)

Indirect Patient Care

Interns spend the largest single block of time during the day on indirect patient care, 49% in our study. However, almost universally, they rate this time as far below neutral in terms of education (1.81) – between ‘disagreeing’ and ‘strongly disagreeing’ that it aids their education, and slightly below neutral in terms of patient care (2.92).

There are a variety of reasons that indirect care is valuable. Medically, it is important to record the details of a patient’s hospital course, thoroughly discuss a patient’s care, and develop a complete plan for discharge. Legally it is important to thoroughly document patient interactions. But how much of this work is necessary and how much of it can and should be done by interns is another question entirely.

The only true bright spot in indirect patient care, and in fact one of the most highly rated activities overall (although it received a small amount of ratings)

is reading literature about patients. In our study interns spent less than two minutes per day reading. This agrees with the literature: Nerenz et al. found that during a 34 hour call day, residents spent an average of 4 minutes reading about their patients. (38) While perhaps this activity is more common at night, because of its high rating in both patient and educational value, it should be protected.

Education

Patient care can be delegated, other providers can do administrative work, but education is the sole aspect of an intern's work that only he or she can accomplish.

In our study, informal educational activities and supervised patient care were both exceedingly valuable activities and very rare activities. Supervised patient care and to some extent attending rounds and work rounds are in a small group of activities that are both valuable to patients as well as valuable to intern education. It follows that these activities should be emphasized where possible.

The most valuable educational activity, although it was only observed a small number of times, was informal educational activity. This makes sense from the perspective that the most valuable educational activities are those that come up throughout the day in relation to specific patient-centered situations. These are difficult to plan, but should be sought out whenever possible.

For the most part, our data agrees with the literature. In a study of educational value of different tasks, morning report and teaching others/informal educational activities were rated as having the highest educational value, while attending rounds, reading, and noon conference were in an intermediate group, and journal club and grand rounds were rated the least educational. (8) A second study agrees, citing work rounds and attending rounds as the cornerstones of medical education. (39)

Magnusson et al. show that while there is some variation, educational time is relatively constant between surgery, emergency medicine, and internal medicine residency programs, so many of these conclusions may hold true across the spectrum. (40)

Transit and Personal Time

While these two activities took a relatively small amount of intern time, they have no value to patients or to the education of interns. Yale has already recognized this and reacted with interventions like localizing teams and combining lunch with educational conferences. While our study did not capture very short, repetitive activities, things like looking for charts, finding computers to use, and searching for notes or other supplies, are all dead time for an overworked intern so should be aggressively identified and eliminated.

Another significant timesaving system might be implementing a method to keep track of patient location throughout the day that could be immediately accessed through the charting system. Frequently transport time was itself wasted as the patient was having an x-ray or other imaging test and was not in the patient's room when the resident arrived.

How Interns Spend Their Time: Association

It is difficult to separate the value of activities from their associations, as many specific activities are done alone, for instance charting and indirect patient care, and many activities must be done with specific members of the medical team. However, we can still draw some general conclusions. Interns spent the largest proportion of their time with other physicians, and the majority of that time with other housestaff, but also spend almost as much time alone as they do with housestaff.

Time Alone

Time alone was the lowest rated association on the education scale, and was among the lowest on the patient care scale. Clearly this is related to the low-value of many of the activities, but particularly as it concerns education, it is likely that there is an effect intrinsic to spending time alone. The only activity

done primarily alone that was rated as extremely valuable was reading literature related to patients, and this was one of the least-commonly observed activities.

On the other hand, managing patients and working alone is one of the core skills that an intern must master to advance in his or her medical career. Interns should not avoid spending time alone, and in fact making clinical decisions without immediate input from other housestaff and attendings is crucial in the development of clinical acumen.

Physicians

Overall, time spent with other physicians was relatively valuable, but this varied between which type of physician. The most valuable time was that spent with the ward attending. Attending rounds were a highly rated activity, and when the ward attending was present for patient care, that improved the activity's value to the intern.

Interventions aimed at increasing the amount of time ward attendings spend with interns and residents are potentially worth exploring. One example is an approach that has been piloted at Yale of dual attendings jointly managing a team. This provides each with the flexibility to manage their patients, while guarding time to teach residents. Another possible arrangement is to have one attending that manages patients, and another who focuses on education.

Finding time to do informal educational activities and run more frequent attending rounds could potentially provide a significant boost to intern education.

Patients and Families

The reasons why interns spend a small amount of time with patients are unclear. One possibility could be role modeling. Another could be that they are simply too busy with so-called 'scut-work' to be able to. This issue was evident even in 1961:

“During his year of training the intern may, in attempting to conserve himself, come to avoid investment in low-priority items (that is, knowing his patient’s perspective of illness and the treatment) and come to concentrate upon higher-priority duties: to know the white-cell count, the electrocardiogram, the cerebrospinal-fluid protein and the serum protein electrophoretic pattern, to determine purified-protein skin reaction and bromsulfalein retention, to do the five blood cultures, to start electrolyte replacement and so forth.” (1)

Whatever the reason, lack of sufficient time for patient care is a significant problem. Hollingsworth et al. have shown that it is often nurses who take the lion’s share of direct patient care on the emotional and comforting side. (41) Medical students as well report a high educational benefit from spending time with patients. (42)

But a higher patient load is not necessarily better. The educational value of new patients is linked to their variety and their acuity, as well as the number of patients each intern carries. The relation to workload has been charted as

parabolic, with a 'sweet-spot' of learning where an intern is not overloaded but does not have too much dead time. (43)

Patients' families as well require significant time and attention. This is an area that has yet to be explored, but could be useful for the medical team assistant to get involved with. If the assistant was present for the entirety of rounds and kept track of the interventions planned for each patient, potentially the assistant could check in with each patient and their family during the day and let them know their schedule.

Limitations

Although the data presented here matches fairly closely that collected by other studies, there are a number of potential weaknesses. The timing of the collection, the methods employed, and the small sample size are all issues.

There is some concern that a Hawthorne effect was present in the data-collection, as it is possible physicians would be less likely to take long lunch breaks, socialize, use the internet, or other leisure activities when they were being observed. However, most house officers stated that they were too busy to even pay attention to the observation and had very little time for leisure activities on any of their call days.

The necessity of pairing 10-minute intervals of ratings with individual activities was another potential source of error. More frequent requests for

ratings would have created too much of a disruption for interns, but grouping activities into 10-minute intervals loses significant granularity of data. For instance, time with nurses is one area that may have been underestimated because most contact with nurses is a quick call responding to a page, or running into a nurse in the charting room, and is rarely an intern's primary activity for a ten-minute period. Interruptions were likely underestimated as a result.

The timing of the data collection may have led to issues as well. No data was collected at night, so activities done more frequently on overnight call (such as reading about patient issues for example) may have been underestimated. No data was collected on non-call days, so activities such as initial patient histories may have been overestimated as well. Another potential flaw was that data was collected while no medical students were on service. While interns are less involved in teaching than other housestaff, this is potentially a source of error.

Further research

Further research could explore a number of issues raised by this data. Beyond the direct look at the effects of the MTA, this study was primarily qualitative, serving to start a discussion at this institution about what the housestaff are doing and what they should be doing. In order to move that discussion forward, a number of additional questions should be asked.

The value of the medical team assistant was assessed in this study as it impacts house staff work rather than patients. The literature argues that another important test of the worth of an intervention is its effect on the patient. (44) This is certainly a fruitful area for continued exploration but beyond the scope of the current study. Possible variables which may be positively changed by the presence of the medical team assistant are the proportion of patients who have their follow-up appointments made by discharge, length of hospital stay, and possible patient satisfaction.

Employing Other Methodologies

One challenge to expanding the data set is the expense of time motion studies. For example, one time motion study of a group of 13 neurosurgery residents took 1,374 hours of one-on-one observation. (26) To get a relatively small amount of data, this study took more 50 hours. Time motion studies may be ideally suited to explorations like this one where they serve primarily to explore one discrete aspect of a workflow, as well as “idea generators” that can open up a wide range of future avenues for research.

For a more broad study, pager-based activity sampling could be used. By combining computer software that automatically paged house staff randomly and collected data through online input, this could be done very cheaply and efficiently. In the future this may be an interesting and useful study to do at Yale.

Activities by time

Our study did not compare intern activity during the day and night, but optimizing which activities are performed at what times might be effective. For example, interruptions were reduced at night with one study of residents finding only 16 pages on average per night. (45) By focusing on direct patient care during the day when patients are awake, and on indirect patient care at night when interns are less likely to be interrupted, perhaps the amount of low value time could be decreased. Future studies could follow interns for entire 30-hour call shifts and collect richer time-based data.

Interruptions and Paging

Knickman et al. found that during a typical 8-hour period, residents were engaged in 62 distinct activities, lasting an average of 7.75 minutes each. (15) While our study did not specifically look at interruptions, they were certainly present to a large degree. Even a few interruptions every hour, along with the time it takes to start and stop a task, multiplied over the year could have an enormous effect on the efficiency and quality of intern work.

Paging is one particularly insidious form of interruption. In the most extensive study of paging identified in the literature, interns were paged an

average of once an hour. (46) Only 34 percent of the pages were judged both to require a response within one hour and to result in a change in patient care. While many pages were important, this study showed that fully 26 percent of pages neither resulted in a change in clinical management nor were clinically indicated. The study's authors also estimated that by reducing the number of superfluous pages, interruptions could theoretically be cut by more than 40%. Paging is almost as bad a problem at night according to the literature, with rates on average of 16-25 pages over a 10-hour overnight call. (46)

Yale has begun to develop a system for replacing pagers with cellular phones. This is certainly an interesting avenue to explore, because having a cellular phone always available will not only decrease the amount of time of the typical pager interruption, but it will also allow interns to complete phone-based tasks much more quickly.

Burnout

While interns begin their training with enthusiasm, that soon gives way to "depression, anger, and fatigue." (48) Many studies have documented the high rates of resident burnout and depression. (48, 49, 9, 50-54) Burnout is a syndrome of personal detachment, exhaustion, and frustration caused by chronic occupational stress. Thus far, no interventions have been effective at decreasing burnout, although a wide variety have been tried, including workshops, a resident

assistance program, a self-care intervention, support groups, didactic sessions, or stress-management/coping training. (54)

Interestingly, in one recent study, interns perceived stress was related not to working more 80 hours per week or amount or quality of sleep, but rather with poorer teamwork. (55) In a vicious cycle, lower levels of well-being have also been shown to negatively effect teamwork and quality of interaction. (50)

One theory of the psychologist Csikszentmihalyi's is that burnout and depression at work are averted when workers spend more time in a state of "flow" – uninterrupted work with tangible positive outcomes and a good match between the worker's skills and the challenges of the work. (56) With the large volume of interruptions, the relatively poor match between the interns' skills of the level of challenge of the work, it is likely that interns rarely enter the flow state. As a result, burnout is much more likely.

Future studies could add a third category of values beyond education and patient care to capture interns' levels of satisfaction with the work they do. Knowing what activities are enjoyable and refreshing would be useful. For example, while personal time may not be valuable to patients and education directly, by improving the mood and energy level of an intern and helping to ward off depression and burnout, this time may be valuable in other ways.

Conclusion

“When does the doctor in training learn how to relate himself to patients? The often heard comment that finer techniques of doctor-patient relations can be ‘picked up’ after the completing of his formal training seems to be contradicted by obvious everyday failures in such relations, which lead to poor patient co-operation in the care of diabetes, hypertension and diet control and patient dissatisfaction, reflected in the rising incidence of malpractice suits, refusal of operations and hospitalizations. To say that patient-management techniques could or should be learned on an amateur basis instead of by example and experience during formal training is to undervalue human relations that powerfully influence the outcome of any therapeutic regimen.” (1)

The above quote, with its concern about risking malpractice, poor patient compliance with diabetes, hypertension, and diet, and the focus on improving relations with patients could come from a paper written last week. But instead it is drawn from Payson’s 1961 study of Yale interns.

This ongoing situation can be seen in one of two ways: either as an indictment of the current system of graduate medical education, or as an argument for changing our perhaps naïve ideas of what interns can and should spend their time on. Whichever conclusion we decide to draw however, it does not make sense to continue to publish criticism for the way the current system works without trying to change it.

The MTA is only a first step, but along with recent initiatives like localization of teams, and giving interns cellular phones instead of or in addition to pagers, it forms a significant piece of a larger strategy and philosophy of how a residency program should work. Running a great program requires constantly questioning assumptions of how graduate medical education should work,

designing frequent pilot projects to test these ideas, and studying their results and refining them. While potentially naïve, Yale's vision of a residency program in which physicians have the time and energy to focus on their education and their patients is truly compelling.

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