

The 4:1 Schedule: A Novel Template for Internal Medicine Residencies

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ABSTRACT

Background It is widely acknowledged that there is need for redesign of internal medicine training. Duty hour restrictions, an increasing focus on patient safety, the possibility of inadequate training in ambulatory care, and a growing shortage of primary care physicians are some factors that fuel this redesign movement.

Intervention We implemented a 4:1 scheduling template that alternates traditional 4-week rotations with week-long ambulatory blocks. Annually, this provides 10 blocks of traditional rotations without continuity clinic sessions and 10 weeks of ambulatory experience without inpatient responsibilities. To ensure continuous resident presence in all areas, residents are divided into 5 groups, each staggered by 1 week.

Evaluation We surveyed residents and faculty before and after the intervention, with questions focused on attitudes toward ambulatory medicine and training. We

also conducted focus groups with independent groups of residents and faculty, designed to assess the benefits and drawbacks of the new scheduling template and to identify areas for future improvement.

Results Overall, the scheduling template minimized the conflicts between inpatient and outpatient training, promoted a stronger emphasis on ambulatory education, allowed for focused practice during traditional rotations, and enhanced perceptions of team development. By creating an immersion experience in ambulatory training, the template allowed up to 180 continuity clinic sessions during 3 years of training and provided improved educational continuity and continuity of patient care.

Conclusion Separating inpatient and ambulatory education allows for enhanced modeling of the evolving practice of internists and removes some of the conflict inherent in the present system.

Editor's Note: The online version of this article contains the Faculty Survey and the Resident Survey questions used in this study.

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Introduction

Background

It is widely recognized that there is a need for a major redesign in internal medicine training. Calls for such redesign have come from the Alliance for Academic Internal Medicine, the Association of Program Directors in Internal Medicine, the Institute for Healthcare Improvement, the Society of General Internal Medicine, the American College of Physicians, and the American Board of Internal Medicine.¹⁻⁶ Recommendations for redesign have focused on stronger competency measurements and promotion of ambulatory general internal medicine education,¹⁻⁶ with some calling for the separation of inpatient and ambulatory training.^{1,2,5} Although these issues have been discussed for some time, the educational processes have remained relatively unchanged.⁷

Many residency training programs continue to place an emphasis on inpatient and subspecialty rotations and rely on continuity clinics to teach ambulatory internal medicine. Continuity clinic sessions occur during, and hence conflict with, "core" rotations. This requires residents to manage responsibilities in multiple clinical arenas simultaneously. A survey found that program directors feel these competing

COHORT	INITIAL TRANSITION SCHEDULING										
	1	2	3	4	5	6	7	8	9	10	
A	ROTATION			AMB	ROTATION			AMB			
B	AMB	ROTATION			AMB	ROTATION			AMB		
C	RTN	AMB	ROTATION			AMB	ROTATION				
D	ROTATION		AMB	ROTATION			AMB	ROTATION			
E	ROTATION		AMB	ROTATION			AMB	ROTATION			

FIGURE 1 4:1 BASIC TEMPLATE STRUCTURE^{a,b}

Abbreviations: AMB, 1 ambulatory week; Inpt Gen Med, inpatient general internal medicine; PGY, postgraduate year.

^a Segments are academic years divided into 5 major blocks (10 wk/block) plus 2 holiday weeks (near the end of the calendar year); teams comprise 2 interns and 1 senior resident.

^b Note the 1-week stagger between PGY-1 and PGY-2/3 status.

responsibilities are problematic and that eliminating this conflict would be beneficial for both inpatient and ambulatory education.⁸

Many residency programs use 4-week block rotations with continuity clinic occurring during a small fraction of time each week.¹ This creates a disjointed experience, making it difficult for residency programs to attain the 130 clinic sessions required by the Accreditation Council for Graduate Medical Education (ACGME) program requirements for internal medicine. The 4-week block rotation also makes patient care continuity difficult. We hypothesized that these factors promote a negative experience in, and attitudes toward continuity clinic.

The conflicts between inpatient and outpatient clinical education have caused many to consider alternative models of training. One such model incorporates long blocks of ambulatory training into the residency curriculum.⁹ These models are still challenged by the need to provide care for patients in both inpatient and outpatient venues. The ACGME internal medicine program requirements mandate that programs “develop models and schedules for ambulatory training that minimize conflicting inpatient and outpatient responsibilities.”^{9,10(p17)} The ACGME standards encourage innovation and experimentation to allow residency programs to test other models of training; therefore, the Residency Review Committee for Internal Medicine granted us a waiver to develop our novel scheduling structure using those guidelines.¹¹

Methods

Setting

We hypothesized that focused time in the inpatient or outpatient arena is superior to a structure built around weekly clinic sessions and that a series of 4-week “core” rotations, alternated with 1-week ambulatory blocks, would provide a better environment for clinical learning. This format ensures that residents have dedicated time for ambulatory training and core rotations but are not away

from continuity clinic for more than 4 weeks at a time. We have used this model since June 2008 in our residency program, which has 48 categorical residents. It is important to note that duty hours were not extended during any part of this program. An alternating 4:1 schedule template allows for ten 4-week rotations, ten 1-week blocks of ambulatory medicine, and 2 weeks of vacation. The 4-week rotations include standard rotations in internal medicine and nonmedicine specialties. The ten 1-week rotations comprise 6 weekly continuity clinic sessions, 1 didactic session, and 3 subspecialty ambulatory experiences.

Residents were divided into 5 groups, termed cohorts A through E. Each cohort had a similar representation of residents from each postgraduate year. To maintain consistent resident presence in all arenas, the cohorts were staggered. FIGURE 1 illustrates the basic template structure. FIGURE 2 illustrates an example of how an inpatient medicine service would be structured with 2 interns and a senior-year resident, our current team structure.

Ambulatory Clinic Redesign

Before the new system, residents were assigned set afternoons for their clinic, without a functional team structure. This prevented a clear mechanism for cross-coverage when a resident was not in clinic. In the new model, each cohort is further divided into 3 groups, termed *subcohorts*, which are assigned specific preceptors, effectively creating 3 practice teams. This allowed a dedicated preceptor to serve as the attending physician for a core team’s patient panel, enhancing educational and clinical continuity.

Methods of Evaluation

The new model of training was assessed quantitatively through surveys and qualitatively through focus groups. The surveys were completed using an anonymous Likert-scale online survey tool (1 = strongly disagree; 5 = strongly agree). They were completed the month before the

COHORT	Residents	10 Week Segments													
		1	2	3	4	5	6	7	8	9	10	1	2	3	4
A	PGY-1	Inpt Gen Med			AMB						AMB				
	PGY-1	Inpt Gen Med			AMB					AMB					
	PGY-2/3				AMB	Inpt Gen Med			AMB						
B	PGY-1	AMB				AMB					AMB				
	PGY-1	AMB				AMB					AMB				
	PGY-2/3	AMB	Inpt Gen Med			AMB					AMB				
C	PGY-1		AMB				AMB					AMB	Inpt Gen Med		
	PGY-1		AMB				AMB					AMB	Inpt Gen Med		
	PGY-2/3	Gmed	AMB				AMB					AMB			
D	PGY-1			AMB			AMB	Inpt Gen Med		AMB					
	PGY-1			AMB			AMB	Inpt Gen Med		AMB					
	PGY-2/3			AMB			AMB					AMB	Inpt Gen Med		
E	PGY-1				AMB	Inpt Gen Med		AMB						AMB	
	PGY-1				AMB	Inpt Gen Med		AMB						AMB	
	PGY-2/3				AMB			AMB	Inpt Gen Med		AMB				

FIGURE 2 4:1 EXAMPLE MEDICINE SERVICE SCHEDULE^{a,b}

Abbreviations: AMB, 1 ambulatory week; Inpt Gen Med, inpatient general internal medicine; PGY, postgraduate year.

^a Segments are academic years divided into 5 major blocks (10 wk/block) plus 2 holiday weeks (near the end of the calendar year); teams comprise 2 interns and 1 senior resident.

^b Note the 1-week stagger between PGY-1 and PGY-2/3 status.

scheduled “go-live” date (May 2008) and again, 7 months after implementation (January 2009). Surveys were sent to the ambulatory clinic faculty and the residents to assess their perceptions of the schedule change. Additionally, focus groups of residents and faculty were held at the end of the first year after implementation.

Results

Survey

Surveys were sent to 48 residents before implementation and 49 residents after implementation. The response rate was 62.5% preimplementation and 69% postimplementation. There were 6 faculty members before implementation and 8 after implementation, with a 100% response rate for both surveys. For each question, we calculated before and after implementation means and standard deviations, and used Fisher exact test to determine the *P* values for each pair of responses (TABLES 1 and 2).

The resident surveys showed many statistically significant changes after the implementation of the new scheduling template (TABLE 1). Statistically significant findings included resident perceptions that (1) their ambulatory experience was more reflective of outpatient general internal medicine (before = 1.87; after = 2.71; *P* < .01); (2) the new scheduling model allowed them to focus on their outpatient education while at the clinic site (before = 3.27; after = 3.82; *P* < .05); (3) the pace and session scheduling improved (before = 2.47; after = 3.76; *P* < .001); (4) patients’ access to care improved (before = 2.33; after = 3.59; *P* < .001); and (5) ambulatory general internal medicine would be an enjoyable field of medicine (before = 2.40; after = 3.24; *P* < .01).

The faculty survey results demonstrate fewer statistically significant differences before versus after

implementation, perhaps due in part to the low number of core faculty surveyed. However, the data did show favorable trends in all categories (TABLE 2). Faculty reported that (1) the overall resident experience provided an adequate opportunity for residents to prepare for outpatient medicine (before = 2.33; after = 3.63; *P* < .05); and (2) the clinic site improved in its goal to provide an ideal educational environment to train residents in outpatient medicine (before = 1.67; after = 2.75; *P* < .05). The survey questions can be found in the online version of this article.

Focus Groups

The results of the focus groups showed that, overall, residents felt that the separation of inpatient and outpatient responsibilities decreased conflict and provided an environment more conducive to learning. During both 4-week rotations and ambulatory weeks, residents reported they could focus on their patients without being concerned about delivering care in other arenas. Additionally, the sense of “team” increased dramatically. Because individual residents were not in their continuity clinic for weeks at a time, teamwork was viewed as extremely important. Laboratory results and studies were now handled by residents in a coordinated team approach, a change from the prior system.

Residents also felt that week-long immersion experiences in ambulatory practice facilitated better patient continuity. The residents valued their ability to schedule same-week appointments for patients requiring close follow-up. The residents reported that scheduling future appointments was facilitated by the ability to schedule patients on any day of their ambulatory week and that the increased continuity contributed to better doctor-patient relationships and enhanced satisfaction.

TABLE 1 RESIDENT 4:1 SCHEDULE SURVEY RESULTS ^a			
Resident Survey Questions	Before 4:1 Schedule, Mean (SD), n = 30	After 4:1 Schedule, Mean (SD), n = 34	P Value
I feel that my ambulatory experiences at clinic are a reflection of outpatient general internal medicine practice.	1.87 (1.04)	2.71 (1.03)	<.01
I feel that based upon my experiences, outpatient general internal medicine is an enjoyable field of medicine.	2.40 (1.28)	3.24 (1.18)	<.01
I feel that a ½-day clinic per week is an ideal ambulatory training model.	2.80 (1.24)	1.76 (0.74)	<.001
I feel that the pace and session scheduling at the clinic is adequate for training purposes and documentation.	2.47 (0.9)	3.76 (0.65)	<.001
I feel that the patients have good access to care in the clinic.	2.33 (1.21)	3.59 (0.92)	<.001
I feel that I am able to focus on my outpatient education while in the clinic.	3.27 (0.87)	3.82 (1.00)	<.05

^a Results are based on results from a Likert-scale online survey tool, where 1 is strongly disagree; 2 is somewhat disagree; 3 is neutral; 4 is somewhat agree; and 5 is strongly agree.

Residents reported that they appreciated having dedicated preceptors in the continuity clinic. This made preceptors more knowledgeable about the residents' patients and each resident's knowledge base, which allowed them to be more efficient in their teaching. Residents reported they appreciated the mentoring relationship with the attending preceptors.

For residents, the effect of the 4:1 schedule extended beyond the continuity clinic. When residents were on inpatient or consultative rotations, they appreciated the additional half-day per week that could be devoted to this experience. This increased their exposure to the rotation by 10%. Also, not being "pulled" each week to go to continuity clinic allowed the residents to consistently see all

TABLE 2 FACULTY 4:1 SCHEDULE SURVEY RESULTS			
Faculty Survey Questions	Before 4:1 Schedule, Mean (SD), n = 6	After 4:1 Schedule, Mean (SD), n = 8	P Value
I feel ambulatory experience provides adequate opportunity for residents to prepare for outpatient practice.	2.33 (1.03)	3.63 (1.19)	<.05
I feel the clinic is an ideal educational environment to train the residents in outpatient medicine.	1.67 (0.52)	2.75 (1.04)	<.05
I feel the residents can focus on their outpatient education while in the clinic.	3.00 (1.9)	3.63 (1.3)	.51

^a Results are based on results from a Likert-scale online survey tool, where 1 is strongly disagree; 2 is somewhat disagree; 3 is neutral; 4 is somewhat agree; and 5 is strongly agree.

patients for whom they had consulted in rounds. Residents felt this improved their education, and that attending physicians were more motivated to teach them, knowing they would be present every day.

On the inpatient services, the resident teams were allowed to remain together while admitting, discharging, and following up on patients. This was seen as a great benefit because it allowed senior residents to consistently oversee interns' activities. Because the schedules of interns and senior residents are staggered, there was an initial concern that the turnover would result in a reduced "sense of team" on the inpatient services. Instead, residents indicated they felt the staggered structure helped team dynamics because there was always a "fresh person" coming into the service. This kept the whole team from "burning out" together. That being said, residents felt that if the teams did stay together for 4 consecutive weeks, coverage of teaching topics by the attending physician would be less repetitive and more efficient.

Focus groups with attending physicians yielded many of the same findings. In the clinic, attending physicians felt they better understood an individual resident's knowledge base and abilities and could focus on his or her areas of weakness, which contributed to more efficient learning sessions. The week-long sessions also provided more opportunities for attending physicians to directly observe resident performance, allowing for more accurate measures of resident competency. The attending preceptors also felt the care delivered was improved through their own enhanced continuity.

With residents present for a week at a time, the attending physicians felt the residents were more engaged in the care that was delivered and in the workings of the clinic. They felt that residents had a better idea of how outpatient medicine was practiced because they could experience what happened "day-in and day-out." The attending physicians felt that this also increased the residents' ownership of patient treatment.

Faculty also reported that residents seemed more satisfied with their clinic experience and less "stressed out." They appreciated that residents were not "in a mad rush" to get out of clinic to fulfill inpatient call responsibilities, which created a much less- hectic environment at the end of the day. Faculty also appreciated the enhanced mentoring relationships that developed within their resident care teams and felt the new system emphasized the importance of primary care and the education delivered to the residents.

In the inpatient setting, faculty appreciated that the "full team" was continuously present to care for patients on the service. The attending physicians felt the interns were more knowledgeable about the patients and had an improved ability to follow through on plans made during rounds. They also appreciated that the senior resident was consistently present to supervise the interns. This allowed the attending physicians to give more responsibility and

autonomy to the resident team, which many felt was an important aspect of inpatient education. One drawback noted by attending physicians was that the staggered schedule made their experience more disjointed and required them to "get to know" team members more often.

On the consult services, faculty also appreciated the 4:1 format. In the old format, the variability in resident schedules left attending physicians uncertain of when residents would be absent. If residents were not present, the attending physicians did not seek them out because they assumed the residents were in clinic or at conference. With the new schedule, a resident's presence was more consistent, allowing for greater accountability and educational opportunity. The attending physicians felt some increased motivation to teach because of the residents' uninterrupted presence.

Discussion

The 4:1 concept provides a unique option for residency redesign, allowing for separation of inpatient and outpatient rotations, providing a mechanism to improve educational and clinical continuity, and allowing for a focused curriculum in ambulatory training. Bowen et al¹² argued that, to improve ambulatory education, the structural design needs to provide equal priority to outpatient medicine. Our model does that through the creation of week-long ambulatory blocks that provide residents with an immersion experience in outpatient medicine, limiting distractions and improving the continuity of educational and patient-care experiences.

Continuity of care is an important concept when evaluating the effects of the new scheduling format. Prior research has shown that patient-care continuity has many benefits, including greater patient, provider, and staff satisfaction; decreased resource use and costs; reductions in emergency department use and hospitalization for patients with chronic illness; and improved clinical outcomes.¹³⁻²⁰ Based on these findings, a structure that promotes continuity of care is an important step in residency redesign.

At first glance, the 4:1 schedule might appear disruptive to clinical continuity because the resident is away from the continuity clinic for 4 weeks at a time. To counteract that issue and to develop longitudinal care for the patient panels, we developed a practice-provider team model.⁸ When a resident is not assigned to clinic, the team becomes the source of continuity, with a member available to see the "away" resident's patient with oversight by a consistent attending preceptor. Although continuity with one provider is most beneficial for patients with chronic diseases, timely access to care is most important for those with higher acuity issues.^{20,21} We found that this approach promoted both continuity and access to care for our patients.

We also noted an improvement in patient care continuity on the inpatient services. The staggering of the

schedule in the 4:1 system allows interns and senior residents to be offset from each other, eliminating the “switch-day” phenomenon that occurred every 4 weeks when the entire team rotated off the service at the same time. Now, when new interns come onto the service, a senior resident can familiarize them with all patients. After several weeks, the new senior resident can be oriented by the interns. This overlap provides better continuity of care and provides a more efficient handoff process.

The 4:1 schedule is an effective mechanism for promoting enhanced educational continuity. In the clinic, residents and preceptors felt that having consistent preceptors for each team promoted more effective and efficient teaching. On the consult services, not only was there a 10% increase in “contact time” with the specialty and the attending physician but education was also enhanced by the uninterrupted availability of the resident. On the inpatient services, however, educational continuity and efficiency were somewhat diminished, given the resident turnover on the team. This component may be minimized if effort is taken to ensure the 2 interns on the service change at the same time, allowing only the senior resident to be “staggered.”

The 4:1 scheduling format positively affected resident and faculty experience and perception. Residents reported an improvement in their overall outpatient training environment, improved patient access to care, and an improved view that general internal medicine would be enjoyable to practice. Faculty felt that the residents’ educational environment and exposure to outpatient medicine improved. These changes in resident and faculty perception are important markers of success.

To encourage a larger number of residents to enter primary care, they must have positive ambulatory experiences. Training residents in dysfunctional settings reduces their interest in primary care.²² As a result of the 4:1 schedule, residents became more engaged in improving clinic processes and systems and more effective in identifying and prioritizing quality issues in the clinic. The enhanced resident engagement also created a more functional and efficient clinic experience.

It is important to note that many resident and faculty responses, before and after implementation, revealed less-than-satisfactory scores, without evidence of statistically significant improvement under the new model. This suggests a need for further efforts in redesigning the residency experience.

The study has several limitations, including the before and after study design. Surveys were anonymous to promote frank feedback, but the absence of a tracking mechanism prevented paired comparisons and further evaluation of responses. Also, a control group would have been valuable in supporting attribution of our findings to the new scheduling design. Practical limitations of our scheduling redesign include its complexity, the inconsistency of resident

schedules while on nonmedicine rotations, its limited appeal and applicability for smaller programs, and the residents’ absence from continuity clinic for 4-week intervals. The system is more complex than a standard rotation schedule, and having residents on a rotation with different start and stop dates poses an organizational challenge. The complexity of the schedule also limits the residents’ ability to arrange for switches and coverage for planned absences. For small residencies, the staggered system might not allow for adequate workforce distribution given the requirements for resident coverage. This effect can be reduced if some rotations and services are able to function without residents (such as consult services). Use of centralized scheduling documentation and residency management software were vital in ensuring up-to-date communication with departments, divisions, faculty, residents, and support staff.

Conclusions

Our residency redesign with the 4:1 schedule allows for the separation of inpatient and outpatient responsibilities. This schedule facilitated continuity of care, increased resident and faculty satisfaction, and enhanced education with improved equality between inpatient and ambulatory training. Resident continuity with chronic patients was not hampered, and coupled with the resident’s ability to focus on outpatient medicine, the residents’ sense of ownership was enhanced. Areas of potential research will focus on the effect to the entire health care team, individual resident continuity data, clinical outcomes, and patient satisfaction, as well as the effect on resident career choices. It is hoped that continued efforts to develop the ambulatory educational experience will begin to positively affect resident satisfaction with ambulatory medicine, and subsequently, enhance matriculation into primary care.

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