

AAIM Perspectives

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X + Y Scheduling Models in Internal Medicine Residency Programs: A National Survey of Program Directors' Perspectives



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INTRODUCTION

Over the last decade, there has been a national call to transform internal medicine training to adapt to changes in health care. The lack of emphasis on ambulatory experiences within residency programs will have potential detrimental effects on training residents for office-based care and may influence resident career choices away from primary care-specific fields.¹⁻⁹ Although the majority of health care is delivered in ambulatory settings, a large portion of internal medicine residency training has traditionally occurred in the inpatient setting.¹⁰⁻¹²

In July 2009, the Accreditation Council for Graduate Medical Education (ACGME) Residency Review Committee for Internal Medicine called for significant

changes in resident continuity clinic training, including increased requirements for ambulatory experience to help improve the focus on ambulatory care and to reduce the tension between conflicting inpatient and outpatient patient care responsibilities that may occur in the traditional weekly scheduling model.¹³ In response to the ACGME mandate, a number of internal medicine programs have transitioned to a variety of “X + Y” scheduling models. In these models, the “X” represents inpatient or nonambulatory rotations that alternate with dedicated ambulatory (or “Y”) blocks. The first published X + Y model was a “4 + 1” model,¹⁴ but since then, numerous programs have developed their own versions, including 3 + 1, 4 + 2, and 6 + 2 models, and other hybrids.¹⁵⁻¹⁸ Several studies of X + Y models have demonstrated decreased fragmentation of care, increased resident satisfaction, and increased resident perceptions of visit continuity.^{16,19}

There are no national data to determine how many programs have adopted or are considering change to an X + Y model. Furthermore, residency program director experiences with such models, including their perceived benefits and challenges, have not been explored at a national level. We conducted a survey of 396 internal medicine residency program directors as part of the

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Association for Program Directors in Internal Medicine (APDIM) Annual Survey. The goals of the “X + Y” survey questions were to evaluate the extent to which programs have adopted X + Y scheduling models, describe program director experiences with the models, and understand the perceived impact of the X + Y models on residency programs.

METHODS

Survey Creation and Administration

The APDIM administers an annual survey of internal medicine program directors. The goal of the survey is to develop a longitudinal database that can help inform organizational policies and initiatives and update members on important topics in graduate medical education.²⁰ For the 2015 survey, email notifications with program-specific hyperlinks to a web-based questionnaire were sent in August 2015 to program directors of 368 APDIM member programs, representing 93% of the 396 ACGME-accredited internal medicine programs nationwide. In addition to biweekly email reminders until the survey closed in November 2015, APDIM survey committee members made personal phone call reminders to program directors who had not yet completed the survey by October 2015. This study was approved by the institutional review board of Mayo Clinic. In December 2014, data from publically available sources, including the ACGME, American Medical Association Fellowship and Residency Electronic Interactive Database, Census Bureau, and American Board of Internal Medicine, were combined with the APDIM data to categorize programs by type (university, community, community-based university-affiliated, military), size (number of ACGME-approved residency positions), American Board of Internal Medicine board pass rate, ACGME cycle length, and US Census Bureau location.²¹⁻²³

We obtained standard data related to program characteristics and program director characteristics (eg, age, gender, academic rank, specialty, and salary). In the section of the survey that was dedicated to questions related to X + Y models, we asked “Does your program use an X + Y scheduling model?” Programs that have not implemented this scheduling model were asked why not. Programs that use an X + Y model were asked 9 additional multiple choice questions to elucidate why they switched to this model, what type of model they have implemented (eg, 4 + 1, 3 + 1, 4 + 2, 6 + 2), years since

implementation, number of ambulatory clinic sessions residents will have in 3 years, changes in career interest in primary care, satisfaction with the X + Y model, considerations for changing models further, and the positive impact and biggest challenges of working with an X + Y model. All questions required a simple answer (eg,

“How many years have you had an X + Y scheduling system?”) or were in multiple choice formats that included the ability to write in alternative answers and comments.

Data Analysis

All data were deidentified before analysis and analyzed using SAS/STAT (SAS Institute Inc, Cary, NC) statistical analysis software for differences between programs that have implemented an X + Y model compared with programs that have not. Cochran–Mantel–Haenszel tests for categorical data comparisons were used to determine significance of differences. In addition, descriptive data were qualitatively analyzed for trends and themes.

CLINICAL SIGNIFICANCE

- The X + Y scheduling model is used by many internal medicine residency programs.
- Some 44% of programs use an X + Y scheduling model.
- X + Y programs are often larger, with 53% of them having more than 75 residents.
- Most program directors perceive that X + Y models reduce trainee burnout and tension between patient care responsibilities.
- Some 90% of programs using an X + Y scheduling model are somewhat satisfied or very satisfied with their system.

RESULTS

Of the 396 internal medicine programs in the United States, 368 are member programs of the APDIM. Of that membership, 227 returned surveys for a 62% response rate. For the section on X + Y schedules, there were 226 responses, yielding a 61% response rate for that specific section. Demographics between responders and nonresponders showed no significant differences in all domains with the exception of a higher response rate from programs in the Northeast (37%) versus the rest of the country (29%).

Table shows some key demographics of programs using X + Y schedules and traditional schedules. Of the 100 X + Y programs, the highest proportion (46%) are located in the Northeast region of the country.

Most X + Y programs (53%) tend to be larger (>75 residents), but 23% are medium-sized programs (46-75 residents), and 24% are small programs (<46 residents). Of the 82 large programs that completed the APDIM survey, 65% (53) use an X + Y model, compared with the 39% (23/59) of the medium-sized programs and just 28% (24/87) of the small programs.

Fifty-seven of the responding programs reported that they offered a primary care track. Of these programs, 68% (39) use an X + Y model, compared with just 32% (18) of programs without a primary care track.

Table Programs Adopting Versus Not Adopting X + Y Schedule Models

Program Characteristics	Adopted X + Y	Did Not Adopt X + Y	P Value
	N (%) =	N (%) =	
	N (%) or Mean (SD)	N (%) or Mean (SD)	
Description (FREIDA)	100 (44%)	126 (56%)	.001
University based	51 (51%)	35 (27%)	
Community based, university affiliated	44 (44%)	73 (58%)	
Community based	3 (3%)	18 (14%)	
Military based	2 (2%)	2 (2%)	
Census Region (US Census Bureau)			.082
Northeast	46 (46%)	38 (30%)	
Midwest	17 (17%)	31 (25%)	
West	16 (16%)	23 (18%)	
South	21 (21%)	36 (29%)	
Program Size (No. of ACGME Positions)			.001
Large, >75 residents	53 (53%)	29 (23%)	
Medium, 46-75 residents	23 (23%)	36 (29%)	
Small, <46 residents	24 (24%)	63 (50%)	
Program Support			
No. of residents/No. of associate program directors	26.5	26.3	.84
No. of residents/No. of chief medical residents	28.6	29.1	.83
No. of residents/No. of staff personnel	42.2	46.1	.59
No. of residents/associate program directors + chief medical residents + staff personnel)	10.4	10.6	.69

ACGME = Accreditation Council for Graduate Medical Education; FREIDA = Fellowship and Residency Electronic Interactive Database Access; SD = standard deviation.

The following were not significant in comparison between the 2 groups: graduates pursuing careers in primary care, age of program director, year program director completed his/her training, whether program director was a chief medical resident, if the program directors identified themselves as a general internist, if the program director felt burned out, amount of time the program director spent with residents, and American Board of Internal Medicine pass rate.

The average number of years in an X + Y model was 2.8 years with median of 2.5 years. The most frequent number of years cited was 1 year; one program reported 9 years. The mean number of continuity clinic sessions residents would obtain in 3 years was 163, with a median and mode of 150.

After switching to an X + Y model, 63% (61/97) of program directors were very satisfied with the model compared with their traditional model; 27% (26/97) were somewhat satisfied. Seventy-nine (83%) kept the original X + Y model they used, 7% converted to a different X + Y model, 7% have considered switching to a different X + Y model, and 2% were somewhat dissatisfied with the transition and considered switching back to a traditional model. Only 1 program director reported that he tried an X + Y model and switched back to a traditional one. Percent satisfaction was similar among the most common types of X + Y models.

X + Y models have numerous permutations as outlined in **Figure 1**. The most common model is the 4 + 1, which is used by one third of the X + Y programs, followed by 4 + 2 and 6 + 2.

From a dropdown list of responses, program directors were asked to choose why they did or did not switch to an X + Y model (**Figure 2**). Most programs cited reduction in resident stress and avoiding duty hour violations

as the primary reasons for switching to an X + Y model. Of the 126 (57%) program directors who decided not to use an X + Y model, 74 (58%) cited that they were satisfied with the current scheduling model and 73 (57.0%) thought that conversion would be too large a disruption to their programs. Thirty-five (27.3%) thought that there were too many medical services to cover; only 28 (21.9%) thought that they did not have the resources to enact the model. "Write-in" answers included more program-specific information but, for the most part, contained similar themes as the multiple choice options.

Figure 3 illustrates the common benefits and challenges that were noted by greater than 50% of program directors using X + Y models. Not surprisingly, "improved ability for residents to focus on their current rotations," "relief from intense inpatient rotations," and "reductions in resident stress" were among the most cited benefits. Citations of "decreased schedule flexibility and complexity" were among the most frequently noted challenges. Additional but less frequently (<50%) cited benefits included easier ability to schedule continuity clinics, stronger relationships between residents and preceptors, desirability to medical student applicants to program, development of tight personal bonds between residents on the same "Y" block, and fewer duty hour violations. Less frequently cited challenges included

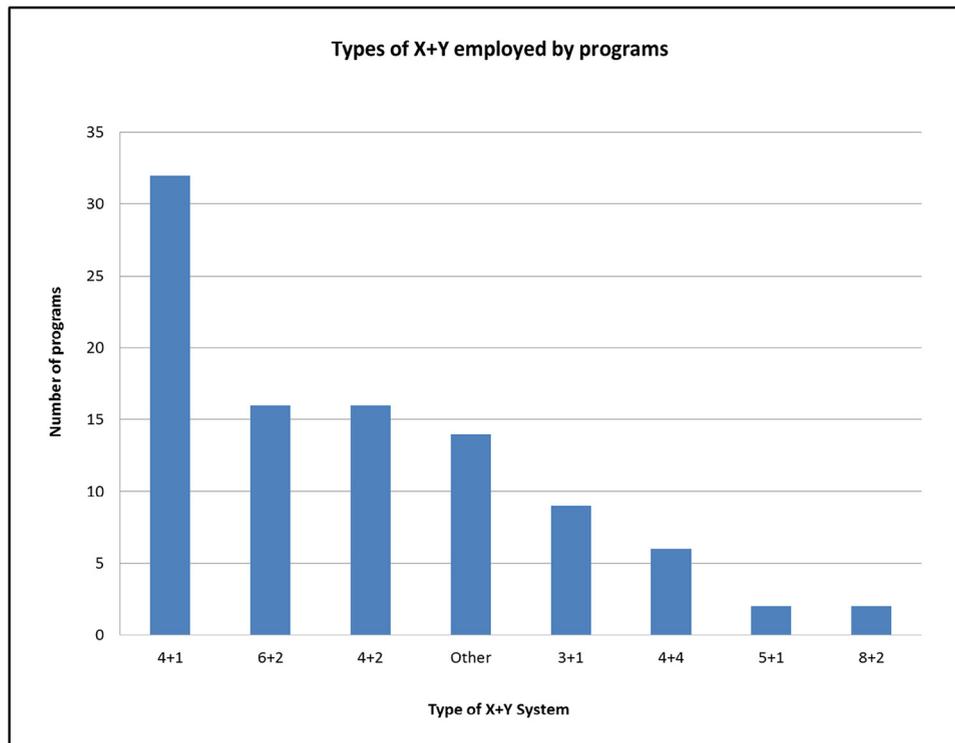


Figure 1 Types of X + Y models used by various programs.

decreased patient access between ambulatory blocks, addressing patient care needs when their primary resident is not on the “Y” block, schedule integration with the residency management software, lack of coordination with faculty schedules, achieving adequate resident staffing on inpatient rotations, and attending or institutional buy-in. Qualitative analysis of the “write-in” answers, for the most part, mirrored and overlapped most of same themes as the multiple choice options.

DISCUSSION

There has been increasing interest in X + Y scheduling models for internal medicine residency training. This article represents the largest and most comprehensive attempt at identifying how many programs are using such models, identifying why programs switched to this model, and what perceived benefits and challenges the models pose. To our knowledge, this is the first national study on the prevalence and perception on X + Y models.

Forty-four percent of internal medicine residency programs are using an X + Y model. Of responding programs, 59% of university-based programs use the model compared with 37% of community-based programs. One possible explanation is that university programs, on average, are larger than community programs, which may allow them to accommodate some of the scheduling barriers inherent in these models. This hypothesis is supported

by the fact that 65% of large programs in the survey use an X + Y model compared with just 39% of medium-sized programs and 28% of small programs.

Although a large proportion of responding programs (37%) were in the Northeast, this group made up a disproportionate number of the programs that used an X + Y model (46%). Because the first X + Y model was developed in eastern Pennsylvania,¹⁴ there was significant regional growth of the model in the Northeast because of local communication and collaboration with the sentinel program and its program director. We postulate that this early growth may have led to the disproportionate number of programs in the Northeast that use the X + Y model.

There seems to be a positive association between the use of an X + Y model and whether the program has a primary care track. In fact, two thirds of programs that have a primary care track use an X + Y model, whereas only approximately one third of programs without a primary care track use the model. This finding may be explained by the size of the programs because it is generally easier to create a track in larger programs. This association may not be causal given the density of X + Y models in the Northeast and the fact that 52% of all primary care programs are located in the Northeast.²⁴

The most common X + Y model used is the 4 + 1 model; one third of programs use this model perhaps because 4 + 1 was the first X + Y model used, published,

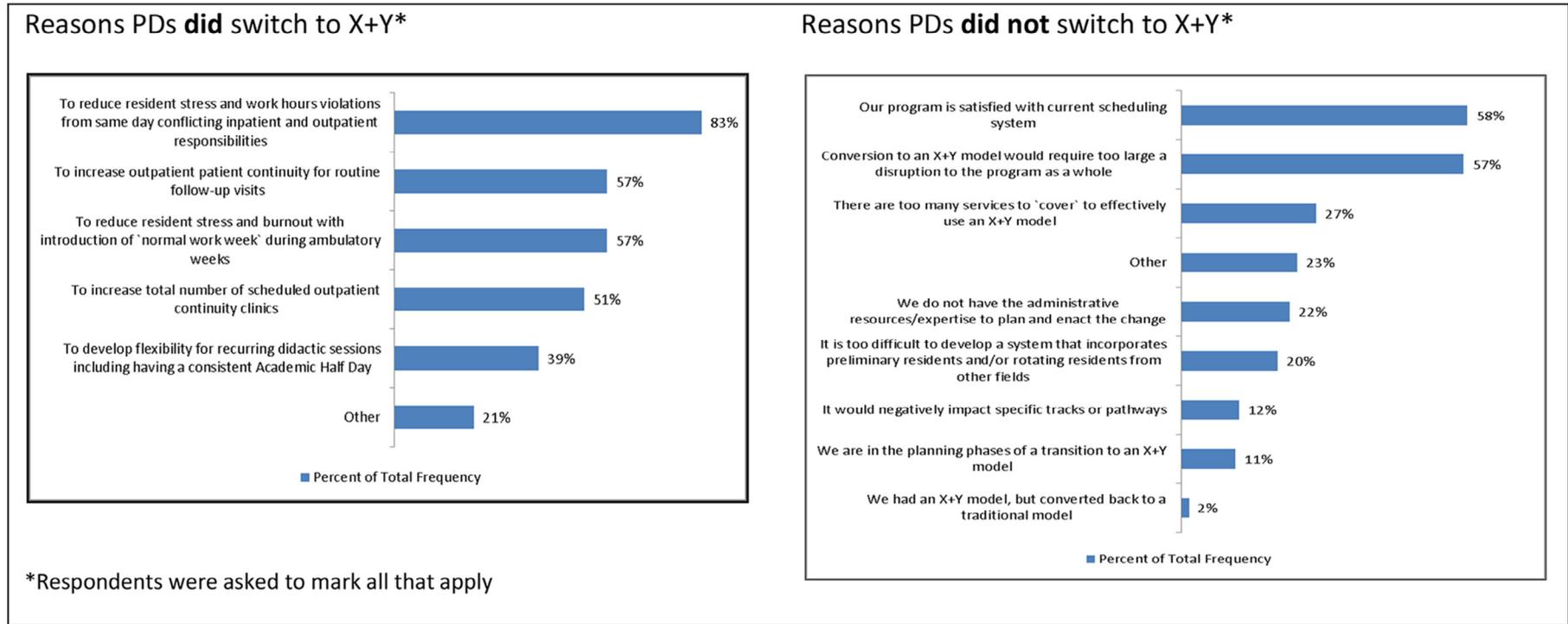
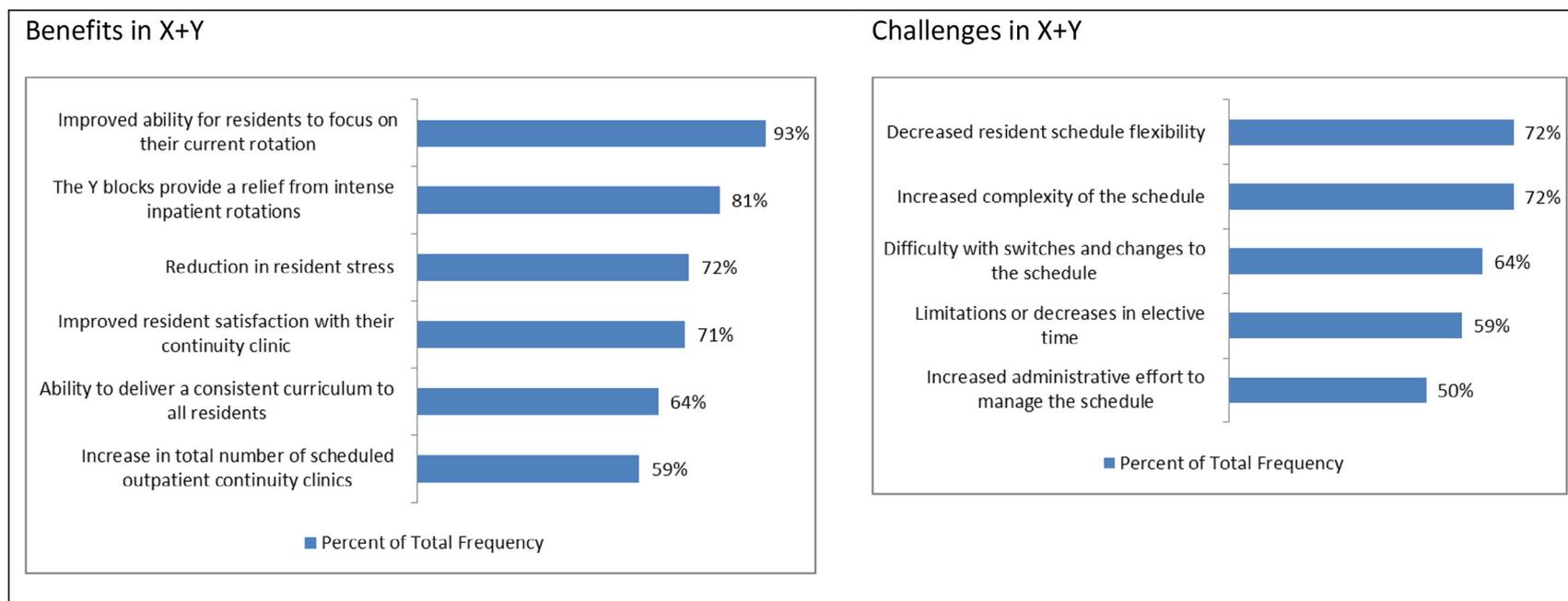


Figure 2 Reasons that program directors cite they did or did not move toward an X + Y scheduling model.



All responses were chosen from a drop down list of options in the electronic survey. Respondents were asked to mark all that apply

Figure 3 Benefits and challenges noted by $\geq 50\%$ of program directors regarding X + Y scheduling models.

and likely used as the model for other programs.¹⁴ The next most common models are the 6 + 2 and 4 + 2 models. The host of “hybrid” models likely reflect the ability of programs to customize their X + Y models.

The overwhelming majority of program directors transitioned to the models to reduce resident stress, meet ACGME duty hour requirements, and minimize conflicting inpatient and outpatient responsibilities. These reasons are consistent with results from several previous studies.^{2,14} More than one half of program directors made the switch to an X + Y model to increase the number of continuity clinics, and 59% thought that they were able to accomplish that goal. Forty-three percent of program directors sought to more effectively deliver didactic curriculum, and 64% reported that they perceived they were able to do it more effectively.

Not surprisingly, the biggest challenges to implementing an X + Y model were decreased scheduling flexibility, increased complexity, and difficulty with schedule changes. This feedback has been consistent among most programs with these models. In addition, most program directors thought that using the X + Y models required a decrease in elective time.

Although X + Y models have clearly grown in popularity, more than one half of program directors have not used such a model. Most of these program directors thought that they were satisfied with their current model (58%) or that the conversion to an X + Y model would be too disruptive to their program (57%). That said, approximately 11% of program directors who have not used such a model reported that they were in the planning phases of a transition to an X + Y model.

The most striking aspect of the survey might be the degree of program director satisfaction with X + Y models. When comparing the X + Y model with their previous model, 63% of program directors were very satisfied with their switch and 27% were somewhat satisfied. However, because programs have used these models for only a median of 2.5 years, different trends may emerge in the future. On the one hand, satisfaction may improve as programs become more familiar with the models and can learn to optimize them. Alternatively, long-range outcomes (eg, patient care and educational metrics) and unforeseen consequences may erode follow-up satisfaction.

Limitations

Our study had several limitations. Although all member program directors received the survey invitation, only 62% of program directors completed the survey. Another limitation is that most programs have only recently transitioned to an X + Y model, and long-term outcomes are not yet discernable. Furthermore, because our survey targeted program directors, we have little understanding of how medical students, residents, faculty, and other health professionals view X + Y models.

CONCLUSIONS

The development of X + Y models over the last decade represents a large shift in the structure of internal medicine training programs. A large portion of programs have decided that the benefits of these models outweigh the obstacles and have converted to such models. It is our belief that the growth of these models will continue and may ultimately become the dominant model for residency scheduling. As the collective knowledge about such models expands, we anticipate advances in technology and educational innovations will help mitigate the more common challenges in implementing these models. Previous studies of X + Y models have looked at continuity of care, resident satisfaction, and disruption of care.^{14,16,19} Further studies need to be undertaken to characterize the progression of X + Y models and understand their long-term effects on patient care, resident burnout, resident competency, and career choices.

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