Evaluating ACGME Milestone 2.0 Performance: A Comparison of Accelerated 3-Year MD and Traditional 4-Year Graduates in Internal Medicine Residency Programs

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ABSTRACT

BACKGROUND: The number of graduates from accelerated 3-year MD (A3YP) programs has increased over the past decade. Previous work showed that A3YP graduates perform comparably to non-accelerated (4-year) graduates from the same medical schools on mid-year and end-year Accreditation Council of Graduate Medical Education (ACGME) harmonized milestones. In shifting to the residency program perspective, it remains unclear how the performance of A3YP graduates compares to non-accelerated graduates including traditional 4-year, international, and osteopathic medical school graduates.

OBJECTIVE: To compare the intern performance of A3YP graduates compared with non-accelerated graduates using mid-year and end-year ACGME milestones in Internal Medicine (IM) residency programs.

DESIGN: The study employed a retrospective cohort design, hypothesizing that graduates from A3YPs were comparable to non-accelerated graduates in the same program.

PARTICIPANTS: 108 interns who graduated from A3YP were compared to 3,542 interns from non-accelerated programs at the same 34 IM residency programs.

MAIN MEASURES: Descriptive statistics were provided for ACGME milestone performance. Cross-classified random-effects regression was used to account for residency program effects and estimate group differences.

KEY RESULTS: After controlling for residency programs, the milestone ratings of A3YP graduates were higher in all competency domains at mid-year except practice-based learning and improvement (PBLI) at .04 ($P = .089$) (coefficients ranged from 0.08 for medical knowledge (MK) ($P < .001$) to 0.23 in professionalism (PROF) ($P < .001$)). These differences persisted at the end-year period (coefficients ranged from 0.05 in PBLI ($P = .039$) to 0.17 in PROF ($P < .001$)) except MK at .02 ($P = .656$). Patient care differences were 0.15 ($P < .001$) at mid- and 0.14 ($P = .005$) at end-year.

CONCLUSIONS: This study contributes to the literature demonstrating that interns graduating from A3YP are at least equivalent in terms of milestone assessment and possibly better in the competencies of PC and PROF than their non-accelerated counterparts.

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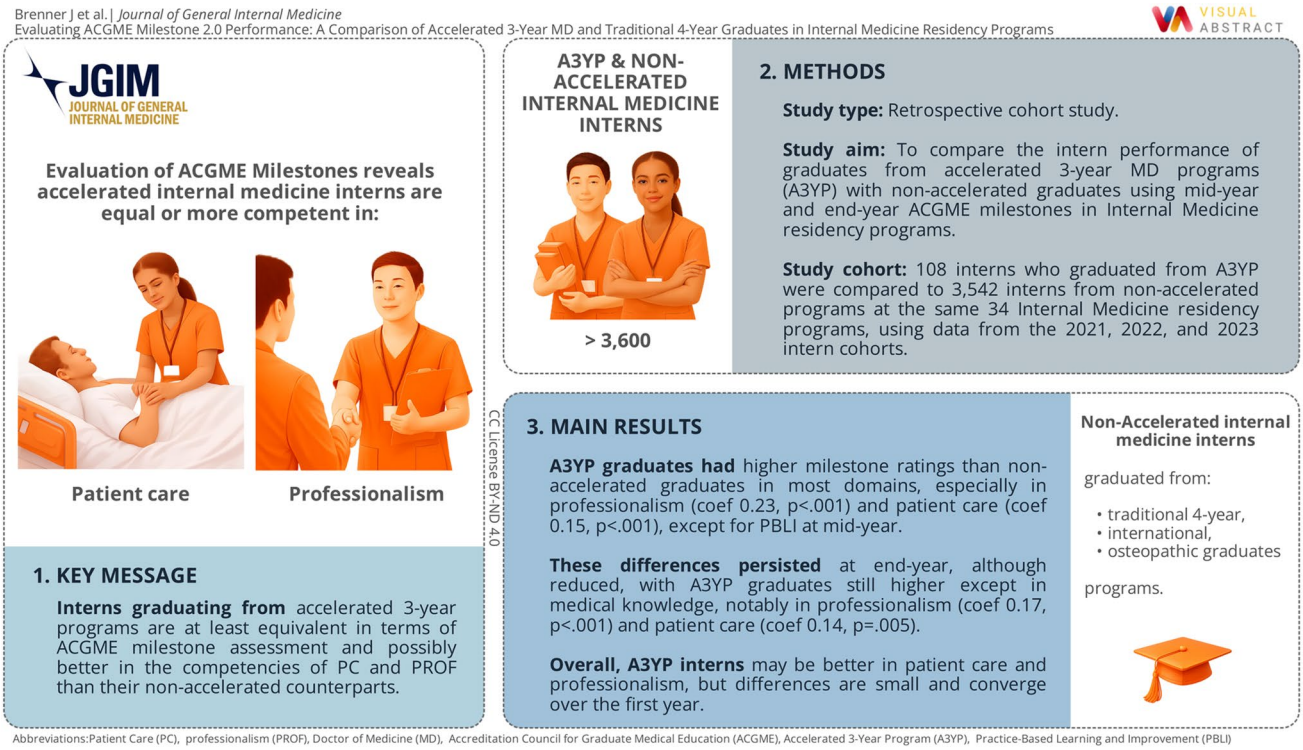
Graphical Abstract



KEY WORDS: 3-year MD; accelerated MD curriculum; ACGME milestones; competency assessment

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BACKGROUND

Over the past decade, accelerated three-year medical school programs (A3YP) have grown significantly, allowing an increasing number of students to earn a Doctor of Medicine degree (MD) in three years.[1–4] While Canada has long had such programs, their resurgence in the United States began with an aim to reduce student debt, individualize education, address workforce shortages, and promote primary care careers.[1,5] The expansion has been remarkably successful, from a few initiatives in 2015 to nearly 40 programs in existence and several more in active planning.[4] Initially focused on primary care and limited in size, some schools have now broadened their scope to offer a three-year pathway for all matriculants in the medical school.[6,7] While many programs still emphasize primary care, A3YP students are increasingly pursuing a wide range of medical specialties.[8] Although most graduates of A3YP enter a directed pathway into residency at their home institution, about one-third (*manuscript under review*) now match into residency programs outside of their home institutions, exposing more program directors to graduates from A3YP.

Historically, A3YPs in the United States have seen mixed success.[9] During WWII, government incentives expanded these programs to meet physician demands, but concerns about competency led to their decline. Similar expansions in the 1960s-70 s also waned due to funding cuts, reduced physician shortages, dissatisfaction with the intense curriculum, and skepticism from both educators and the medical community regarding the quality of the educational experiences, the level of student competency and professional development, as well as readiness for residency, stress, and burnout.[9–11]

To ensure the continued growth and acceptance of A3YP in this third wave, it is crucial to provide data on outcome measures to enable the medical education community to make data-informed decisions.[12] Demonstrating that A3YP graduates perform at least on par with their peers from traditional non-accelerated four-year programs in residency placement, board examination scores, and clinical competency will help these programs gain broader acceptance and credibility within the medical community. This focus on outcomes will support the sustainability and expansion of accelerated medical education programs.

Outcomes from three-year MD programs have shown promising results that should reassure program directors and stakeholders that graduates from A3YP perform similarly on the United States Medical Licensing Examination

(USMLE) Step 1, and only slightly less well on USMLE Step 2 Clinical Knowledge, perceive being prepared for residency, report a positive learning environment, and graduate with less debt.[8,13–15] Finally, and most importantly, Santen et al. reported equivalent year one ACGME harmonized milestone ratings when comparing graduates from A3YP vs. 4-year programs from the same medical schools for mid-year and end-year of internship in internal medicine, emergency medicine, family medicine, general surgery, psychiatry and pediatrics.[16] This study was reassuring to medical schools that they were training their graduates to a similar standard.

Program directors, however, need additional information to help make interview and ranking decisions, namely once in the same residency program, are 3-year graduates as well prepared as 4-year graduates? Therefore, this study will take the lens of internal medicine (IM) residency programs who have accepted graduates from A3YP with the objective of comparing them to non-accelerated graduates in the same program using ACGME Milestones 2.0 mid- and end-year as outcomes.

STUDY DESIGN

We used a retrospective cohort design exploring whether interns from A3YPs had comparable performance on their ACGME mid- and end-year milestones compared to other interns who had not graduated from accelerated programs within the same IM residency programs during the first year of residency.[16]

PARTICIPANTS

A3YP medical school graduates of 2021, 2022, and 2023 (3 cohorts) entering IM internships were compared to non-accelerated incoming interns at the same IM programs, including traditional 4-year graduates, international medical graduates (IMGs), and graduates from osteopathic medical schools (non-accelerated). The ACGME registry was used to identify the A3YP graduates using records of interns who graduated and entered the IM residency program during the 2021, 2022, and 2023 years. Graduates were matched to the ACGME data using name, medical school, residency program, and National Provider Identifier (NPI). The A3YP cohort included 108 incoming interns of 113 graduates of A3YP (identification rate 95.6% in the ACGME data registry). There were 3,542 non-accelerated interns at the same IM programs in the comparison group.

Table 1 Demographic Information of Graduates

	A3YP	Non-Accelerated Graduates
US Doctor of Medicine (MD) Medical School	108	2751
Doctor of Osteopathic Medical School	0	342
Non-US Medical School	0	448
Canadian Medical School	0	1
Female	56	1715
Male	49	1781
Prefer not to respond or other categories	2	44

Abbreviations: *A3YP*, accelerated 3-year program

MAIN MEASURES

The ACGME Milestones[16] include 6 competency domains and trainees are assessed on milestone levels using a 9-point scale with ordinal levels ranging from "Level 1" (resident demonstrates performance expected of an incoming resident) to "Level 5" (advanced performance demonstrating "aspirational" goals beyond graduation target) with 0.5 intervals between the levels. "Level 4" is designated as the target for residents by the time of graduation (labeled as proficiency). Programs can also indicate the residents were "not assessed." Programs report all sub-competencies in the specialty for each six-month reporting period (mid-year reporting period in December and end-year reporting period in June). Decisions and associated processes are within the purview of the residency program and its leadership based on consensus of the clinical competency committee (CCC) and the program director. For this study, sub-competency scores were aggregated at the competency domain level.

Descriptive statistics and box plots were used to examine data trends between A3YP and comparison non-A3YP residents. To account for residency program effects, cross-classified random-effects regression was used to account for clustering and to estimate group differences. The medical school graduates match into different IM programs which creates a "cross-classification" matrix of varying learners clustered within medical schools to matriculate into different residency programs that also have varying program-specific variance. To account for both school and residency program effects (medical school-specific variability and residency program-specific variability), we used cross-classified random-effects regression to account for clustering and to estimate group differences. We use unstandardized coefficients to interpret findings; that is, the impact of A3YP on first-year residency milestone ratings for patient care (PC), medical knowledge (MK), interpersonal and communications skills (ICS), professionalism (PROF), practice-based learning and improvement (PBLI), and systems-based practice (SBP). An indicator variable for A3YP was created as a binary factor to examine milestone differences. A secondary analysis using the same methods compared the A3YP residents to only traditional MD residents in the sample (excluding DO and IMG interns). A 2-sided $P < 0.05$ was considered to be statistically significant. Data compilation and analyses were

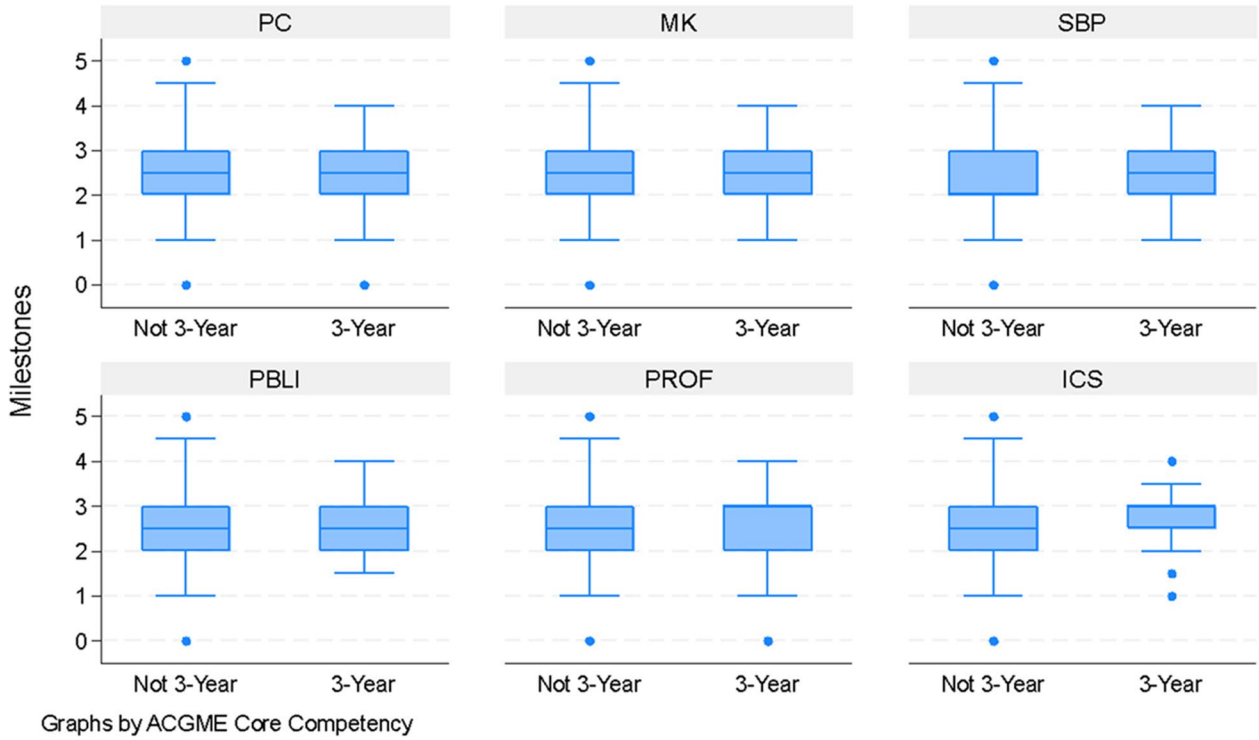

Figure 1 Box plots of milestone ratings between non-accelerated programs graduates (n = 3,542) and accelerated 3-year program graduates (n = 108) in internal medicine residency programs (n = 34 programs) at mid-year. The mid-year reporting period is the first 6 months of post graduate year 1. Each plot corresponds to a different Accreditation Council for Graduate Medical Education competency domain. Abbreviations: PC, patient care; MK, medical knowledge; SBP, systems-based practice; PBLI, problem based-learning and improvement; PROF, professionalism; ICS, interpersonal and communication skills.

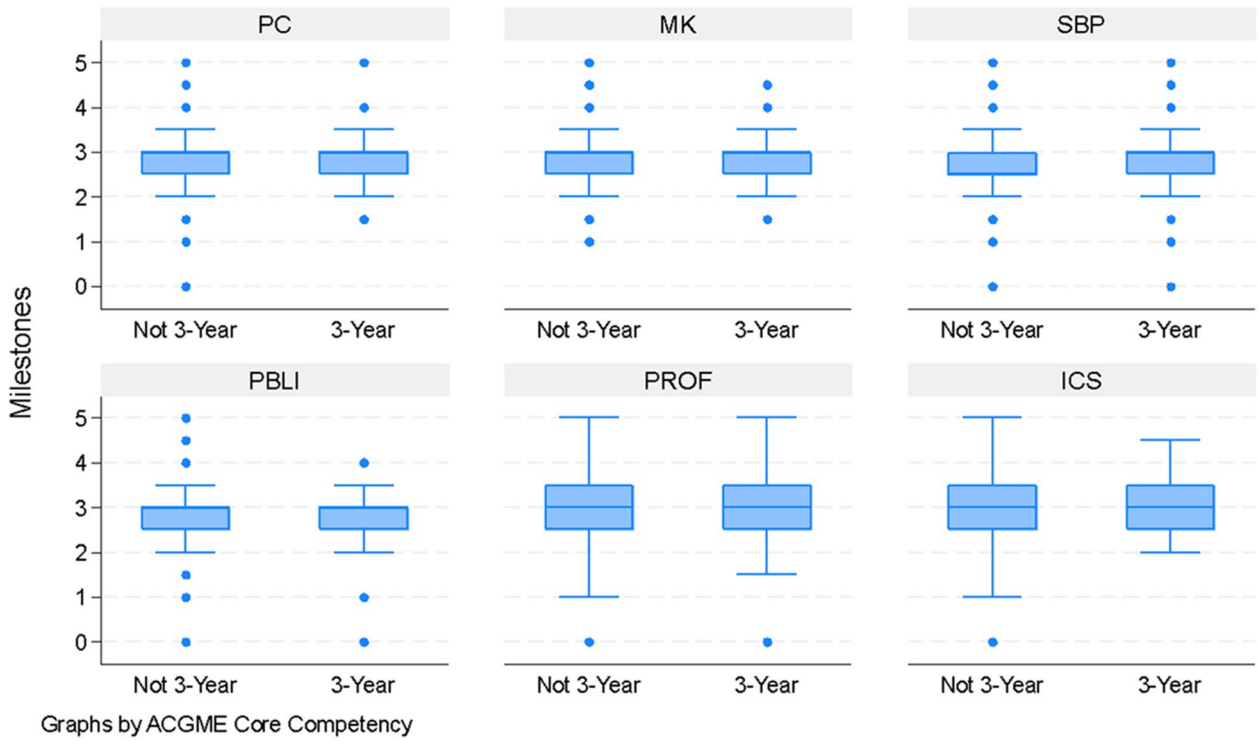

Figure 2 Box plots of milestone ratings between non-accelerated programs graduates (n = 3,542) and accelerated 3-year program graduates (n = 108) in internal medicine residency programs (n = 34 programs) at end-year. The end-year reporting period is the last 6 months of post graduate year 1. Each plot corresponds to a different Accreditation Council for Graduate Medical Education competency domain. Abbreviations: PC, patient care; MK, medical knowledge; SBP, systems-based practice; PBLI, problem based-learning and improvement; PROF, professionalism; ICS, interpersonal and communication skills.

Table 2 Comparison of IM Milestones Ratings Between A3YP and Non-accelerated Graduates: Coefficient Estimates from Cross-Classified Regression[a,b,c]

Competency	Mid-Year Reporting			End-Year Reporting		
	Coef[b]	SE[b]	*P*-value[c]	Coef[b]	SE[b]	*P*-value[c]
PC	.15	(.03)	<.001	.14	(.05)	.005
MK	.08	(.02)	<.001	.02	(.03)	.656
SBP	.13	(.04)	<.001	.10	(.03)	.002
PBLI	.04	(.02)	.089	.05	(.02)	.039
PROF	.23	(.04)	<.001	.17	(.04)	<.001
ICS	.11	(.03)	<.001	.08	(.03)	.002

Legend:

Abbreviations: IM, Internal Medicine; A3YP, accelerated 3-year program; PC, patient care; MK, medical knowledge; SBP, systems-based practice; PBLI, problem based-learning and improvement; PROF, professionalism; ICS, interpersonal and communication skills

[a]Analyses accounted for clustering among medical schools and competencies, using cross-classified random-effects regression models

[b]Coefficients (SEs) indicated group Milestone differences between A3YP and non-A3YP

[c]*P* values are associated with cross-classified random-effects regression estimates

conducted using Stata 18/MP (StataCorp, College Station, Texas). The institutional review board of the University of Illinois at Chicago approved this study.

KEY RESULTS

A total of 113 students graduated from the A3YP program; 108 (96%) were identified in the ACGME database and matched at 34 IM programs. For comparison, we used data from 3,542 interns who did not graduate from accelerated programs but are from the same IM residency programs. Of the entire sample, 78.3% of the graduates were from US-MD schools, 9.4% were from DO schools, and 12.3% were from international schools with roughly equal numbers of males and females (Table 1).

Figures 1 and 2 show descriptive statistics (box plots) for mid-year and end-year milestones, comparing graduates of A3YP to non-accelerated graduates. Overall, milestone ratings during PGY-1 (intern) mid-year and end-year reporting periods are comparable with interquartile ranges overlapping between the A3YP and comparison non-A3YP groups.

Table 2 shows differences in milestone ratings between A3YP and non-accelerated groups using cross-classified random-effects regression. Positive coefficients indicate higher milestone ratings for A3YP graduates. Controlling for the IM residency program, A3YP graduates had significantly higher milestone ratings compared to comparison non-accelerated graduates in all competency domains at mid-year except for PBLI. At mid-year, the coefficients ranged from 0.08 for MK to 0.23 for PROF. To interpret the coefficient estimate of 0.23, for example, A3YP graduates were scored 0.23 milestone units higher on the PROF milestones compared to the comparison non-accelerated graduates, $P < 0.001$. At year end, A3YP graduates had slightly higher milestone scores across competency

Table 3 Comparison of IM Milestones Ratings Between A3YP and Only US Medical Degree Graduates: Coefficient Estimates from Cross-Classified Regression[a,b,c]

Competency	Mid-Year Reporting			End-Year Reporting		
	Coef[b]	SE[b]	*P*-value[c]	Coef[b]	SE[b]	*P*-value[c]
PC	.10	(.03)	.001	.05	(.02)	.013
MK	.09	(.04)	.025	.01	(.03)	.631
SBP	.21	(.05)	.001	.08	(.03)	.006
PBLI	.10	(.06)	.075	.01	(.04)	.082
PROF	.06	(.04)	.119	.04	(.03)	.110
ICS	.10	(.04)	.015	.05	(.03)	.068

Legend:

Abbreviations: IM, Internal Medicine; A3YP, accelerated 3-year program; PC, patient care; MK, medical knowledge; SBP, systems-based practice; PBLI, problem based-learning and improvement; PROF, professionalism; ICS, interpersonal and communication skills

[a]Analyses accounted for clustering among medical schools and competencies, using cross-classified random-effects regression models

[b]Coefficients (SEs) indicated group Milestone differences between A3YP and non-A3YP

[c]*P* values are associated with cross-classified random-effects regression estimates

domains compared to comparison non-accelerated graduates except for MK and coefficients ranged from 0.05 in PBLI to 0.17 for PROF. The coefficients in patient care (PC) were higher at both mid (0.15) and end (0.14) year when comparing the A3YP graduates to the non-accelerated graduates. For the most part, as the interns progress in their training, the A3YP and non-accelerated graduates merge in terms of performance.

The secondary analysis compared the A3YP residents to only traditional non-accelerated MD graduates (excluding DO and IMG) and demonstrated significantly higher coefficients at mid-year that ranged from 0.09 for medical knowledge (MK) to 0.21 for SBP ($P = 0.001$) (Table 3).

DISCUSSION

This study builds on the work of Santen et al.[16] which focused on graduates from the medical school perspective and found that the performance of A3YP and traditional 4-year non-accelerated graduates entering residency programs in several specialties including IM was no different using ACGME Harmonized Milestones 2.0. By shifting focus to the IM residency program's perspective, this study addresses a question relevant to program directors regarding the preparedness of A3YP graduates in comparison with non-accelerated (4-year) graduates, including students graduating from 4-year MD, DO, and international medical schools. Results reveal that after controlling for IM residency programs, the milestone ratings of A3YP graduates were equivalent or higher in all competency domains at the mid-year with only one exception, PBLI. Notably, however, some of the statistically significant but small coefficients are not likely educationally significant. Milestone differences persist but with smaller differences (coefficients) at the end-year period with the exception of MK. Furthermore, the differences in milestone scores in PC and PROF are notable for larger differences in coefficients at mid- and end- year among graduates of A3YP in comparison with non-A3YP. The results suggest that the accelerated training may foster strong foundational skills and should reassure residency program directors that A3YP graduates are well prepared for residency, certainly at least as well prepared as their non-A3YP counterparts.

While the results of this study contribute to the emerging narrative that graduates of accelerated programs are at least as prepared as their non-accelerated peers, the milestone difference in PC and PROF at mid- and end-year deserves exploration. The higher early milestone ratings may reflect intentional emphasis on these domains in accelerated curricula. A3YP graduates' performance could reflect the accelerated professional identity formation that results from closer mentoring relationships fostered by smaller cohort sizes and more individualized training environments for the accelerated graduates. The higher milestone scores may also be explained, in part, by the graduates themselves, who self-select into A3YP programs and, based on a prior study, were older and worked in professional life prior to medical school[8] while entering with similar MCATs and GPAs. In addition, because many students in A3YP have directed residency spots at home institutions, it is possible that higher milestone ratings in PC and PROF reflect familiarity with the institution—i.e., a "homefield" advantage.[18–20] When comparing A3YP to the non-accelerated US MD graduates only (excluding DO and IMG interns), the coefficient for SBP becomes significant. This may also reflect homefield advantage. Unfortunately, in this dataset we are unable to identify which of the non-accelerated MD graduates remained at their home institutions. Thus, further study of these potential confounders through a multi-institutional study may be useful.

Alternately, the higher milestone differences could be explained by loss of skills among students in their fourth year of medical school. The value of the fourth year has been a subject of debate.[21–23] Graduating students at the University of Colorado School of Medicine suggest that students look to the fourth year for career identification and professional development as well as for the opportunity to explore diverse practice settings and personal interests as opposed to progressive competency development.[23] Similarly, international graduates may have a significant gap between their last clinical exposure and starting residency.

While the results of this study are promising, the importance of distinguishing between statistical significance and educational significance should be emphasized, as modest differences in milestone ratings in the first year of postgraduate training may not ultimately translate into improved patient care and may not persist beyond year one. By 12 months, although several competency domains remained statistically significant, the magnitudes of the differences were small, and their educational relevance may be limited. This convergence over time may reflect the natural adaptation and progression of all residents as they gain clinical experience. Alternatively, it may suggest that initial differences, potentially influenced by earlier clinical immersion and accelerated training in A3YP, level out as training environments become more uniform as postgraduate training continues. Future studies following the progress of graduates of A3YP as they progress beyond the first year of postgraduate training will answer this question.

None the less, our study should provide added reassurance to IM program directors regarding the selection of graduates from A3YP by providing an answer to the question—*are they prepared?* Program directors face challenges in selecting and ranking applicants, and it is unclear how program directors' decisions are impacted by knowing that an applicant has graduated from an accelerated curriculum. With more A3YP graduates applying and matching outside their home institutions (*manuscript under review*), program directors will

increasingly encounter these applicants. Signaling may also lead to more program directors considering A3YP applications.[24,25] Our study shows that A3YP graduates perform as well or better in several competency domains compared to non-A3YP graduates, reassuring residency programs about the quality of A3YP education and training.

Looking ahead, our study opens avenues for future research. Among them, our group will explore whether the early advantages seen in A3YP graduates are sustained throughout residency. We will also explore the role that "homefield" played. In addition, other data sets, such as the AAMC Resident Readiness Survey[26,27] and burnout data should be analyzed to continue to explore outcomes of A3YP. The ultimate metrics are those related to patient care. While those are several years away, our group will continue to lay the groundwork for effectively investigating relevant questions.

LIMITATIONS

The limitations of this study must be acknowledged to fully understand the implications of the findings regarding A3YP graduates. In some residency programs there is limited variability of milestones reporting to the ACGME, which can decrease the sensitivity of detecting differences.[20] In addition, the analysis is confined to residency programs where A3YP graduates have successfully matched, which is limited to 34 of 576 (5.9%) IM residency programs in the US. This narrow focus may not adequately represent the full spectrum of residency programs nationally, as the specific characteristics of these programs—such as their training environment, faculty dynamics, and available resources—can influence performance metrics. Therefore, the results may not be generalizable across all residency programs, and may not be transferable to other specialties. As the A3YP sample is relatively small, the results may be influenced by outliers in milestones reporting. The selection, characteristics, experience, academic performance, and other characteristics of A3YP graduates may be substantively different from their non-accelerated peers and may confound the findings. Finally, as some of the A3YP are focused on developing a primary care physician workforce, findings may be influenced by concordance of medical school program and residency focus on primary care.

CONCLUSIONS

This study contributes to the emerging data-driven narrative of A3YP as providing quality education and training that prepares students to progress into residency training. In addressing the hypothesis regarding intern preparedness among A3YP in comparison with their non-accelerated counterparts, this study reassures the medical education community that A3YP are at least equivalent and possibly better in the competencies of patient care and professionalism.

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Author Contribution *JMB, YSP, JC, and SAS were involved in the conception of this project and study design.*
JMB, YSP, AGF, JC, and SAS were involved in data collection. YSP conducted data analysis. JMB, YSP, AGF, JMB, YSP, JR, SOH, AGF, AR, JC, and SAS were involved in interpretation of data. JMB, YSP, and SAS were the primary writers. All co-authors have reviewed, edited, and approved the final version of this manuscript.

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Data Availability *The datasets used during and/or analyzed during the current study are available from the corresponding author on reasonable request.*

Declarations

Conflict of interest *Sally Santen, MD, PhD is a senior advisor for the American Medical Association. Yoon Soo Park, PhD is a consultant for the Accreditation Council for Graduate Medical Education. All remaining authors have no conflicts of interest to report.*

Disclosures *The thoughts and ideas expressed in this article are those of the authors and may not represent official AMA policy.*

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