Professional Development Perceptions and Practices Among U.S. Physicians: A Cross-Specialty National Survey

David A. Cook, MD, MHPE, Morris J. Blachman, PhD, David W. Price, MD,
Colin P. West, MD, PhD, Richard A. Berger, MD, PhD,
and Christopher M. Wittich, MD, PharmD

Abstract

Purpose

Professional development (PD)—both for-credit continuing medical education (CME) and informal self-directed or point-of-care learning—is vital to all physicians. The authors sought to understand physicians' PD perceptions and practices and how these vary by specialty and practice type.

Method

The authors administered an Internet and paper survey, from September 2015 to April 2016, to randomly sampled U.S. physicians. Survey items addressed perceived PD needs and barriers and how physicians identify knowledge/skills gaps.

Results

Of 4,648 invitees, 988 (21.6%) responded. Respondents believed that they already know what they need to learn (mean 5.8 [1 = strongly disagree; 7 = strongly agree]), can answer clinical questions using available resources (5.9), and want credit for learning during patient care (5.1). They did not strongly desire help identifying learning gaps (4.0) or indicate difficulty accumulating CME credits (3.1). Most PD was done during personal time (5.5). Competencies regarding medical knowledge/skills, wellness, informatics, and practice/systems improvement were rated the highest priority, while research, teaching, and professionalism were rated the lowest. The most important sources used to identify knowledge/skills gaps were immediate patient care needs (4.1 [1 = not important; 5 = extremely important]), personal awareness (3.8), and practice updates (3.7). The most important barriers were time (3.5) and cost (2.9). Differences by specialty and practice type were generally small and not statistically significant.

Conclusions

Physicians feel confident in identifying their own learning needs, perceive medical knowledge/skills as their highest-priority need, and desire more credit for learning during patient care.

Professional development (PD), including both formal for-credit continuing medical education (CME)[1–3] and informal learning pursued in response to patient-oriented clinical questions or other self-identified learning needs,[4–7] is vital to every physician's professional success.[1,2,6,8] Yet experts have raised concerns regarding how CME is delivered, financed, regulated, and evaluated.[1,8] Evidence suggests that common CME approaches, such as educational meetings,[9] printed materials,[10] and audit and feedback,[11] have only limited impact, while interactive, multimodal activities reinforced over time have a greater likelihood of changing practice.[12,13] Additionally, physicians incompletely understand their own PD needs or how they might effectively identify and address these needs.[7,14–17] Moreover, physicians tend to focus on their clinical knowledge and skills, rather than on other important competencies such as communication, teamwork, practice improvement, and lifelong learning. In response, leaders have called for system-wide transformations in PD delivery[1–3,6,8] and the fostering of physicians' ability to identify and meet their own learning needs.[6,7,16]

Professional organizations, certification boards, nonprofit foundations, for-profit businesses, state medical boards, and other government organizations have all contributed to discussions around the optimization of PD for physicians. By contrast, research documenting the beliefs, attitudes, and desires of physicians regarding their PD is relatively sparse. Recent surveys have focused on a narrow subset of PD issues, including information-seeking behaviors,[18] online CME,[19–21] assessment and feedback,[22] and industry support.[23] A survey conducted in 2000 among physicians in one U.S. health care organization addressed several important issues, but these findings are outdated.[24] More recent surveys in Canada, Australia, the United Kingdom, and Germany have examined modality preferences and usage (e.g., face-to-face, journal, or online) and barriers to PD,[25–28] but only one quantified perceived PD needs,[25] and none looked at how physicians identify their learning needs. Most surveys are also limited by a narrow sampling frame (e.g., a single specialty, institution, or geographic region), and recent information on U.S. physicians is notably lacking. A broadly representative physician survey addressing a range of current issues in PD and CME would inform efforts to create a PD system that effectively targets the greatest needs and creates meaningful support rather than unnecessary barriers.

We conducted a nationwide, cross-specialty survey of U.S. physicians to answer the following questions:

1. What do physicians perceive as their highest-priority PD needs?

2. What do physicians believe regarding how PD needs are and should be identified?

3. What barriers do physicians encounter in their PD?

4. How do these beliefs vary by specialty and practice type?

We formulated specific hypotheses for each question and list these together with a short summary of our actual findings in Supplemental Digital Appendix 1 (available at http://links.lww.com/ACADMED/A434).

Method

We surveyed licensed U.S. physicians using a self-administered Internet and paper questionnaire, from September 2015 through April 2016. Survey items addressed beliefs about PD and maintenance of certification; the latter findings have been published separately.[29]

Sampling and human subjects

We identified a random sample of 4,648 licensed U.S. physicians from the LexisNexis Provider Data Management and Services database (LexisNexis Risk Solutions, Alpharetta, Georgia). The contact dataset included information on age, gender, location, and specialty. We tracked Internet survey completion, but all survey responses were anonymized. We offered all participants a nominal gift (a book costing less than $12) for participation. This study was approved by the Mayo Clinic institutional review board.

Survey instrument

The authors, all experienced educators with backgrounds working in academic medical centers, integrated care delivery systems, and medical specialty boards, collaborated to create the survey questionnaire. We reviewed expert panel reports[1,8] and prior surveys[18,24,26,30] and consulted with colleagues to identify key current PD issues. These issues included how physicians prioritize professional competencies, identify learning needs, meet those needs, learn in the workplace, learn with other professionals, accumulate CME credits, pay for PD, and anticipate using new educational technologies and other resources. We used these reports and surveys to generate survey items addressing each issue. We based our list of core competencies on the Accreditation Council for Graduate Medical Education competencies[31] and on the CanMEDS 2015 framework,[32] with an additional competency related to physician well-being.[33] Most items consisted of either seven-point bipolar Likert-type items (1 = strongly disagree; 7 = strongly agree) or five-point unipolar response options (1 = nothing or not at all; 5 = a very large amount or extremely). To keep the survey length manageable, we divided the questionnaire into two sections of approximately equal length and allowed participants to submit the survey after completing the first section ("primary items"); those willing to continue could respond to the additional "secondary items." We also included items about demographic information and burnout.[34]

Four CME experts reviewed the draft items to identify omissions and redundancies. Mayo Clinic Survey Research Center staff with expertise in questionnaire development verified item structure and wording. We piloted the questionnaire among 17 physicians representing anesthesiology, dermatology, emergency medicine, family medicine, internal medicine, neurology, pathology, psychiatry, and surgery, and we revised items based on their feedback.

Through iterative discussion, we identified five key items: competency priority scores for knowledge/skills and for practice/systems improvement, the barriers of time and of cost, and the desire for help identifying PD gaps.

The survey instructions defined PD as:

> All activities intended to improve your professional knowledge, skills, or performance. This includes a variety of activities such as studying journal articles, reading UpToDate, participating in a live or online course, or doing a practice audit-and-improvement. It also includes learning for both clinical and non-clinical responsibilities such as teaching, research, and leadership.

It further defined CME as "a subset of professional development that awards formal credit for completing professional development activities."

Survey administration

We first contacted physicians via e-mail. Initial and reminder e-mails contained an individualized link to an Internet-based questionnaire administered using Qualtrics (www.qualtrics.com). We sent up to 10 reminder e-mails. A subset of physicians received one paper mail reminder as part of a randomized subexperiment.[35]

We sent a paper questionnaire to those who did not respond to the Internet survey within three months. The paper questionnaire had no identifying information such that responses could not be tracked. Mayo Clinic Survey Research Center staff processed all Internet and paper responses without investigator involvement to preserve respondent anonymity.

Analyses

To characterize the sample, we used respondent-reported demographic information when available; we used information from LexisNexis to fill in missing data. We created an overall priority score for each professional competency by multiplying the respondent's ratings of importance and learning need.

We explored the possibility that nonrespondents were systematically different from respondents in two ways. First, we compared specialty, practice location, and gender (i.e., information from the LexisNexis dataset) among respondents and nonrespondents using the chi-square test. Second, because evidence suggests that the beliefs of late respondents closely resemble the beliefs of those who never respond,[36] we compared responses from those who responded near the end of the survey period (the last 15% of responses) with those who responded earlier, using the five key items defined above. We also compared the distribution of respondents' specialties against the national distribution published in the Association of American Medical Colleges 2014 Physician Specialty Data Book.[37]

We planned a priori analyses exploring variations in responses by specialty (generalist [nonsubspecialist family medicine, internal medicine, and pediatrics], surgical specialist [surgery, anesthesiology, and obstetrics–gynecology], and nonsurgical specialist

[all others]); practice type (self-employed, group [including government], and academic); and burnout. We conducted additional exploratory analyses, which we identify as such in the Results.

We used Spearman rho to evaluate correlations among item responses. We used both the paired *t* test and the Wilcoxon signed rank test to compare within-subject differences in responses and obtained essentially identical results; we report the signed rank results. We used general linear models to test associations between survey responses and respondent characteristics and to compare responses on primary survey items among those who did versus did not complete the secondary items. Because of the large sample size and multiple comparisons, we used a two-tailed alpha of 0.01 as the threshold of statistical significance in all analyses. We used SAS version 9.4 (SAS Institute Inc., Cary, North Carolina) to conduct these tests.

Results

Survey response and sample characteristics

We sent 4,648 survey invitations, of which 646 e-mails and 223 paper questionnaires were undeliverable and 65 were undeliverable via either e-mail or paper. We received 988 responses (631 Internet, 357 paper). Using the conservative denominator of 4,583 potential respondents (excluding the 65 undeliverable by either method), our response rate was 21.6%. A less conservative estimate excluding all 934 undeliverable invitations leaves 3,714 potential respondents, yielding a response rate of 26.6%.

Demographic characteristics of invitees and respondents are reported in Table 1. About half the respondents completed the second half of the questionnaire. Those who completed the second half reported a greater desire for help identifying learning gaps (mean 4.2 vs. 3.9; 95% confidence interval for difference 0.1–0.5; *P* = .002), whereas we found no statistically significant differences in responses for the other four key items (listed above) among those who did versus did not complete the second half (data not shown).

Respondents and nonrespondents were comparable across all available characteristics, except that the proportion

Table 1

Demographic Characteristics of Respondents to a National Survey of U.S. Physicians About Attitudes Toward Professional Development, 2015–2016

Demographic characteristics	Invited, % of 4,583 (no.)	Responded, % of 988 (no.)[a]
Specialty		
Anesthesiology	5.1 (231)	5.4 (53)
Diagnostic subspecialties	6.8 (311)	5.5 (54)
Family medicine	10.9 (496)	10.0 (98)
Internal medicine, general	12.8 (586)	11.0 (108)
Internal medicine subspecialties	15.4 (701)	14.8 (145)
Obstetrics–gynecology	6.1 (278)	5.6 (55)
Pediatrics	7.7 (352)	7.8 (76)
Pediatric subspecialties	2.1 (95)	4.5 (44)[b]
Surgery and surgical subspecialties	15.2 (694)	15.1 (148)
Other clinical specialties	18.0 (821)	20.1 (197)
Gender		
Male	66.6 (3,054)	66.2 (590)
Female	33.4 (1,529)	33.8 (301)
Region		
Northeast	21.6 (987)	20.6 (199)
Midwest	20.9 (955)	22.8 (221)
South	34.1 (1,563)	33.7 (326)
West	23.4 (1,072)	22.9 (222)
Community size[c]		
Rural	7.8 (359)	7.0 (43)
Urban	92.2 (4,218)	93.0 (571)
Practice type		
Self-employed	N/A[d]	24.8 (243)
Medical group or hospital		47.5 (465)
Academic		18.3 (179)
Government		5.2 (51)
Other		4.1 (40)
Burnout		
Emotional exhaustion	N/A[d]	33.7 (309)[e]
Depersonalization		18.0 (165)[e]
Either emotional exhaustion or depersonalization		38.1 (349)[e]
Years since training		
1–10	N/A[d]	18.8 (181)
11–20		29.0 (280)
21–30		29.6 (285)
> 30		22.6 (218)
Practice size		
1 physician	N/A[d]	13.6 (133)
2–5 physicians		23.1 (226)
6–25 physicians		29.7 (290)
> 25 physicians		33.6 (328)
Compensation model		
Salary (fixed)	N/A[d]	35.3 (345)
Salary with incentives		31.3 (305)
Productivity		33.4 (326)

(Table continues)

Table 1
(Continued)

Demographic characteristics	Invited, % of 4,583 (no.)	Responded, % of 988 (no.)[a]
Race		
American Indian	N/A[d]	0.7 (6)
Asian		15.2 (131)
Black		2.6 (22)
Pacific Islander		0.2 (2)
White		81.3 (701)
Ethnicity: Hispanic	N/A[d]	5.9 (49)

[a]Numbers may not sum to 988 because of missing data. Percentages are calculated using all available data.
[b]$P < .001$ compared with nonrespondents.
[c]Community size was only available for those respondents who completed the Internet survey.
[d]Characteristics marked "N/A" (i.e., not available) were obtained from the survey and thus only available for respondents.
[e]Data for 918 respondents were available for the burnout items.

of responding pediatric subspecialists was greater than that of nonresponding pediatric subspecialists (see Table 1). The distribution of specialties among respondents closely mirrored the published data for all U.S. physicians[37] ($P > .06$), except that our sample included slightly fewer general internal medicine and family medicine physicians (absolute difference about 4% for both, $P < .001$). We compared the responses of those responding early versus late in the survey period and found no statistically significant differences for the five key items.

Of respondents, 38% met the criteria for being burned out, defined as experiencing either emotional exhaustion (34%) or depersonalization (18%) on at least a weekly basis.[34]

Attitudes about PD and CME

From respondent-reported attitudes about various PD issues, we identified five key points or messages. Table 2 contains verbatim wording of the survey items and response summary data; Supplemental Digital Appendix 2 (available at http://links.lww.com/ACADMED/A434) reports responses using the full 1–7 scale. For simplicity, we report only means in the paragraphs below, but note that the standard deviations varied from 1.1 (suggesting relatively uniform or homogenous attitudes) to 2.0 (reflecting less uniform attitudes) (see Table 2).

First, responding physicians strongly and uniformly agreed that they already know what they need to learn (mean rating 5.8 [1 = strongly disagree; 7 = strongly agree]), and they did not strongly desire help identifying learning gaps (4.0). When asked about specific sources to identify gaps, information on patient outcomes was rated higher (4.8) than support from "someone I trust" (4.4) or objective tests (4.4) (95% confidence interval for difference 0.3–0.6; $P < .001$ for both comparisons). However, few reported currently using objective performance data to identify learning needs (3.8). Respondents did not agree that CME credit is a dominant influence in choosing learning activities (3.3).

Second, physicians would like more credit for the things they learn while addressing the needs of specific patients (5.1). They strongly and uniformly agreed that they can quickly find answers to patient-specific questions using already-available resources (5.9) but agreed less strongly that their practice provides adequate point-of-care knowledge resources at no direct cost (4.3). They strongly and uniformly agreed that point-of-care online learning is vital to effective patient care (5.3) and that CME should ideally occur in the context of their clinical practice (5.9).

Third, physicians did not indicate much difficulty in finding (3.3) or accumulating (3.1) needed CME credits. Although most PD is done in their personal time (5.5), they did not strongly endorse concerns about feeling behind in their PD activities (3.7). About half perceived that they can meet their CME requirements using activities already available on-site in their workplace (4.3). Responses were neutral regarding both the value of money

spent on CME (4.1) and the financial burden of PD activities (4.1). Other items about the benefits of accredited CME received favorable responses (4.5–5.2). Respondents indicated that they would not stop doing accredited CME even if it were not required (2.8). They did express strong interest in centralized tools that would list CME opportunities and track CME completion (5.7).

Fourth, physicians strongly and uniformly endorsed the value of discussions with peers when learning, with slightly greater perceived value when learning controversial topics (5.9) than clearly defined practices (5.6). Opportunities to learn with peers were more highly valued (5.2) than opportunities to learn with nonphysician health care professionals (4.3). Only a minority desired more education on working as interprofessional teams (3.7).

Finally, physicians expressed the desire for more online learning (4.6) but somewhat less interest in more simulation-based learning (4.2).

We conducted preplanned subgroup analyses based on specialty and practice type for selected items (see Supplemental Digital Appendix 3, Table 1, available at http://links.lww.com/ACADMED/A434, for details). Self-employed physicians reported doing more PD in their personal time (5.9) than those in group practice (5.5), and both groups reported higher ratings than those in academic practice (4.9; $P < .001$ for each pairwise analysis). Those in group practice perceived less burden from the total cost of PD activities (3.9) than self-employed physicians (4.4; $P = .003$). We found no statistically significant differences across practice type ($P \geq .05$) for "I know what I need to learn to do my job well," desire for help identifying gaps, or finding answers using available resources. We found no statistically significant differences across specialty ($P \geq .05$) for any items.

Prioritizing physicians' PD needs

We asked physicians to prioritize professional competencies in three ways (see Table 3 and Supplemental Digital Appendix 4, available at http://links.lww.com/ACADMED/A434)—the importance to their professional practice, their perceived need for learning, and the

Table 2
Physicians' Attitudes Toward Professional Development, From a National Survey of U.S. Physicians, 2015–2016

Item	Mean (SD), median[a]	Agree, % (no./N)[a]	Key point[b]
Primary survey items			
I can quickly find answers to patient-specific questions using resources available in my workplace.	5.9 (1.1), 6	91.4 (854/934)	2
I know what I need to learn to do my job well.	5.8 (1.1), 6	88.3 (824/933)	1
I do most of my professional development in my "personal" time.	5.5 (1.5), 6	76.7 (718/936)	3
I wish I could get more CME credits for the things I learn while addressing the needs of specific patients.	5.1 (1.6), 6	64.4 (601/933)	2
Relevant information on my patient outcomes would help me make better choices in professional development.	4.8 (1.5), 5	64.6 (605/936)	1
I would like to use more online learning in my own professional development.	4.6 (1.5), 5	55.3 (518/937)	5
It would be useful to have someone I trust help me figure out what I need for my professional development.	4.4 (1.7), 5	52.1 (486/932)	1
I would welcome feedback from a periodic non-compulsory objective test of knowledge and skills to help me target my true learning needs.	4.4 (1.8), 5	54.4 (509/935)	1
My practice provides adequate point-of-care knowledge resources at no direct cost to me.	4.3 (1.9), 5	51.2 (478/934)	2
If I choose, I can meet most of my CME requirements using activities readily available on-site in my workplace.	4.3 (2.0), 5	51.4 (480/934)	3
I would like to use more simulation-based training in my own professional development.	4.2 (1.7), 4	46.2 (432/935)	5
The money I pay for accredited CME activities is well spent.	4.1 (1.7), 4	44.6 (417/936)	3
The total cost of my professional development activities is a burden to me.	4.1 (1.9), 4	45.6 (426/935)	3
I would like more help identifying gaps in my professional abilities.	4.0 (1.7), 4	44.2 (412/933)	1
I would like more education on how to work effectively as part of an interprofessional team.	3.7 (1.7), 4	32.8 (306/934)	4
I always feel behind in my professional development activities relative to where I want to be.	3.7 (1.8), 4	40.7 (382/938)	3
It is hard to find accredited CME that truly addresses my practice needs.	3.3 (1.8), 3	28.6 (267/934)	3
I often find myself scrambling to accumulate enough CME credits when I'm renewing my medical license.	3.1 (1.9), 2	27.4 (256/936)	3
Secondary survey items			
Discussion with peers adds value when learning about controversial topics.	5.9 (1.0), 6	91.9 (388/422)	4
CME should ideally occur in the context of my clinical practice.	5.9 (1.1), 6	90.0 (380/422)	2
It would be helpful to have a central Web site that lists CME opportunities along with participant reviews.	5.7 (1.2), 6	82.9 (349/421)	3
It would be helpful to have a central repository that automatically tracks my CME completion data.	5.7 (1.3), 6	81.0 (341/421)	3
Discussion with peers adds value when learning about topics for which best practices are clear.	5.6 (1.1), 6	86.5 (365/422)	4
Point-of-care online learning is vital to effective patient care.	5.3 (1.3), 6	74.7 (316/423)	2
The knowledge and skills I obtain in accredited CME programs are helpful in meeting the needs of my patients.	5.2 (1.3), 5	77.1 (327/424)	3
I value opportunities to learn with a group of my peers.	5.2 (1.3), 5	72.2 (304/421)	4
Accredited CME activities meet my professional development needs.	4.9 (1.4), 5	70.4 (298/423)	3
Accredited CME activities improve patient safety.	4.5 (1.5), 5	53.2 (225/423)	3
I value opportunities to learn with non-physician health care professionals.	4.3 (1.6), 4	45.5 (191/420)	4
I seek out topics for study based more on what I enjoy learning about than what I need.	4.1 (1.5), 4	42.7 (180/422)	—
I currently use objective performance data to help me determine where I need to improve.	3.8 (1.7), 4	39.0 (165/423)	1
I choose accredited CME learning activities more for the credit than to learn.	3.3 (1.8), 3	29.6 (125/422)	1
I would stop doing accredited CME if it were not required.	2.8 (1.7), 2	18.9 (80/423)	3

Abbreviation: SD indicates standard deviation; CME, continuing medical education.

[a]Response options ranged from 1 = strongly disagree to 7 = strongly agree. Agree indicates a rating of slightly agree, agree, or strongly agree. The questionnaire was split into two sections, and about half of respondents completed only the first section (primary survey items). Total respondents ranged from 932 to 938 for the first section and 420 to 424 for the second section. Percentages are based on available data for each item. Items are sorted in order of mean rating; see Supplemental Digital Appendix 2 (available at http://links.lww.com/ACADMED/A434) for the original item sequence and raw results.

[b]Numbers correspond with the empirically derived key points or messages outlined in the text: (1) Physicians already know what they need to learn and do not want help identifying learning gaps; (2) physicians want credit for the things they learn during patient care; (3) physicians do not have difficulty accumulating CME credits; (4) physicians value discussions with peers when learning; and (5) physicians' interest in new educational technologies. One item did not clearly fit within any of these themes, so no theme is listed.

Table 3

Prioritization of Physicians' Professional Competencies, From a National Survey of U.S. Physicians, 2015–2016[a]

Competency	Mean (SD), median prioritization				Mean priority score by practice type[b]			
	Important in practice	Hard to find	Need to learn	Priority score[b]	Self	Group	Acad	P
Medical knowledge/skills	4.5 (0.6), 5	1.5 (0.9), 1	2.6 (0.7), 2	11.6 (3.8), 10	10.7	11.8	12.3	< .001
Skills for avoiding burnout/maintaining wellness	3.5 (1.1), 4	2.9 (1.2), 3	2.9 (1.2), 3	10.6 (6.2), 9	9.7	10.8	11.2	.04
Practice/systems improvement	3.8 (1.0), 4	2.5 (1.1), 3	2.7 (0.9), 3	10.4 (4.8), 10	9.5	10.4	11.3	.002
Informatics and other technology skills	3.6 (1.0), 4	2.6 (1.1), 2	2.9 (1.0), 3	10.4 (4.9), 10	10.0	10.3	11.2	.04
Communication and teamwork skills	4.4 (0.7), 5	2.4 (1.1), 2	2.2 (0.8), 2	9.6 (3.9), 10	8.9	9.6	10.5	< .001
Management/leadership	3.4 (1.1), 3	2.5 (1.1), 3	2.6 (1.0), 3	9.1 (5.1), 8	8.2	8.8	10.8	< .001
Professionalism	4.4 (0.7), 5	2.4 (1.1), 2	1.9 (0.7), 2	8.4 (3.4), 8	8.1	8.4	9.0	.05
Teaching/education	3.5 (1.1), 4	2.3 (1.0), 2	2.3 (0.9), 2	8.3 (4.3), 8	7.2	8.2	10.1	< .001
Research/scholarship	2.5 (1.2), 2	2.6 (1.2), 3	2.4 (1.2), 2	6.5 (4.7), 6	5.2	6.0	9.8	< .001

Abbreviations: SD indicates standard deviation; Self, self-employed; Group, medical group or hospital practice; Acad, academic practice.

[a]Physicians rated each competency according to three questions: (1) "How important are each of the following competencies (areas of knowledge or skill) in your overall professional practice?" (2) "If you tried, how hard would it be to find and complete professional development activities focused on each of the following competencies?" (3) "How much do you think you need to learn or improve in each of the following competencies?" Response options ranged from 1 = not important at all/not hard to find to 5 = extremely important/extremely hard to find. Total respondents ranged from 890 to 902. Items are sorted in order of mean rating; see Supplemental Digital Appendix 4 (available at http://links.lww.com/ACADMED/A434) for the original item sequence and raw results.

[b]Priority scores were calculated by multiplying the scores for "important" and "need to learn" (range 1–25). All differences in priority score across specialties were small and not statistically significant ($P \geq .05$).

difficulty in finding learning activities in that domain. We found substantial differences across these three measures. For example, medical knowledge/skills was ranked highest for importance but lowest on difficulty to find and midrange for perceived learning need. Professionalism was ranked second highest in importance but lowest in perceived learning need. Research was judged to be of lowest importance and was also rated middle or low for difficulty to find and learning need.

We calculated a priority score for each competency (importance × learning need). Medical knowledge/skills, wellness, informatics, and practice/systems improvement had the highest priority scores, while research, teaching, and professionalism had the lowest.

In analyzing priority scores across practice type, we found a consistent pattern— namely, those in academic practice had the highest priority scores for all competencies, and self-employed physicians had the lowest (see Table 3). These differences were statistically significant for medical knowledge/skills, communication, practice/systems improvement, teaching, research,

and management. We found no significant differences in priority scores across specialties ($P \geq .05$; see Supplemental Digital Appendix 3, Table 2, available at http://links.lww.com/ACADMED/A434). Medical knowledge/skills had the highest priority score in all practice types and in all specialties.

How physicians identify PD needs

We sought to further understand how physicians identify the gaps in their knowledge and skills that lead them to pursue PD. We asked them to rate the importance of eight information sources that might prompt them to study a specific topic (see Table 4 and Supplemental Digital Appendix 5, available at http://links.lww.com/ACADMED/A434), both in their current practice and in an ideal setting (as it "ought to be"). Immediate patient care needs, personal awareness (self-assessment), and new practice updates were rated highest (means for current importance: 4.1, 3.8, and 3.7, respectively); the lay press, objective tests of knowledge or skill, and topic listings for a CME course were rated lowest (2.3, 2.7, and 2.8, respectively). Most sources were rated as slightly more important in the ideal setting, with actual practice data

and objective tests showing the largest positive difference (although ratings were still low compared with other sources). Two sources—the lay press and the topic listings for CME courses—were rated slightly lower in an ideal setting.

We selected in advance three current information sources for subgroup analysis: personal awareness, objective measurement, and actual practice data. Physicians in group practice reported greater importance for objective measurement (mean 2.8) than self-employed physicians (2.5; $P < .001$), and surgeons reported greater importance for actual practice data (3.2) than nonsurgical specialists (3.0; $P = .003$). We found no other statistically significant differences across practice type or specialty ($P \geq .015$).

Barriers to PD

Respondents did not strongly endorse any of the barriers to pursuing PD (see Table 5 and Supplemental Digital Appendix 6, available at http://links.lww.com/ACADMED/A434). About half identified time as a "very" or "extremely" important barrier, and about one-third identified cost as such. Fewer than 20% identified as important the other

Table 4

Importance of Information Sources in Helping Physicians Identify Learning Needs, From a National Survey of U.S. Physicians, 2015–2016[a]

Information source	Current		Ideal	
	Mean (SD), median	Important, % (no./N)[b]	Mean (SD), median	Important, % (no./N)[b]
Immediate patient care needs	4.1 (0.9), 4	79.5 (716/901)	4.2 (0.8), 4	82.7 (737/891)
Personal awareness (self-assessment) of gaps in knowledge or skill	3.8 (1.0), 4	66.5 (600/902)	4.0 (0.9), 4	75.3 (673/894)
Recently published guidelines or practice updates	3.7 (1.0), 4	61.4 (553/901)	3.8 (0.9), 4	68.5 (610/891)
Actual practice data	3.0 (1.1), 3	36.9 (331/897)	3.5 (1.1), 4	52.4 (466/889)
Colleague recommendations	3.0 (1.1), 3	32.5 (293/902)	2.9 (1.0), 3	30.6 (273/891)
Topics listed for available CME courses	2.8 (1.0), 3	24.4 (219/897)	2.7 (1.1), 3	23.2 (207/891)
Objective measurement (e.g., test of knowledge or skill)	2.7 (1.1), 3	24.9 (224/900)	3.1 (1.1), 3	36.4 (325/893)
Lay press (e.g., hot topics patients might ask about)	2.3 (1.0), 2	13.2 (119/903)	2.2 (1.0), 2	10.9 (97/893)

Abbreviations: SD indicates standard deviation; CME, continuing medical education.
[a]Physicians rated each information source in response to the question, "How important are each of the following in helping you identify what you need to learn or do differently in your work?" They then indicated "How important do you think each of the following ought to be?" (i.e., the ideal). Response options ranged from 1 = not important at all to 5 = extremely important. Differences between ratings for current and ideal were statistically significant ($P < .006$) for all items except colleague recommendations ($P = .16$). Items are sorted in order of mean rating; see Supplemental Digital Appendix 5 (available at http://links.lww.com/ACADMED/A434) for the original item sequence and raw results.
[b]Important indicates a rating of very or extremely important.

anticipated barriers, which included finding activities, getting CME credit, accessing information, and selecting topics.

We found statistically significant differences across specialties for "I'm not sure what is most important to learn about" (generalists highest, nonsurgical specialists lowest) and for "There isn't much new to learn" (surgeons highest) (see Table 5). Across practice type, respondents in academic practice reported time as a greater barrier (mean 3.8) than those in group practice (3.5) or self-employed practice (3.4) ($P = .009$; see Supplemental Digital Appendix 3, Table 3, available at http://links.lww.com/ACADMED/A434). We found no other statistically significant differences in perceived barriers across practice type ($P \geq .13$).

Associations with burnout

We found statistically significant associations ($P \leq .007$) in all planned analyses exploring associations with burnout (see Supplemental Digital Appendix 7, available at http://links.lww.com/ACADMED/A434). Compared with those not meeting the criteria for burnout, respondents who were burned out reported greater barriers

arising from time (mean 4.0 vs. 3.3), difficulty finding relevant activities (2.5 vs. 2.3), and cost (3.1 vs. 2.8). They also indicated a stronger desire for help identifying gaps (4.3 vs. 3.9), a greater burden from cost (4.5 vs. 3.8), and a higher burnout/wellness competency priority score (13.3 vs. 8.9).

Subgroup analyses for key items

We performed subgroup analyses across all demographics for the five key items (see Table 6). Years since training showed statistically significant associations in all analyses, with longer-practicing respondents reporting lower priority scores for medical knowledge/skills and practice/systems improvement, less of a barrier for time and cost, and less desire for help identifying gaps. We found no statistically significant differences across specialty, geographic region, community size, or practice size.

Other exploratory analyses

We hypothesized that younger physicians would express stronger desires for interprofessional training. We found a statistically significant association ($P < .001$), with those in practice for 1 to 10 years (mean 3.9) and 11 to 20 years (4.0) rating

this desire higher than those in practice for 21 to 30 (3.4) or > 30 years (3.4).

We also found a statistically significant inverse relationship between perceived ability to self-assess learning needs ("I know what I need to learn to do my job well") and a desire for help identifying learning needs (rho = −0.30, $P < .001$).

Discussion

We conducted a national cross-specialty survey of U.S. physicians to identify their PD priorities, practices, beliefs, and needs. We found that physicians generally believe that they already know what they need to learn and do not desire help identifying learning gaps, that finding and accumulating formal CME credits is not a significant concern, and that they would like more credit for the learning they accomplish while caring for patients. Medical knowledge/skills was rated as the most important and highest-priority professional competency, and PD activities for this competency were viewed as the easiest to find. Skills for wellness, practice/systems improvement, and informatics also received high priority rankings, and related activities were considered moderately hard to find. Physicians rated immediate patient care needs, personal awareness (self-assessment), and new practice updates as the most important means of identifying learning gaps, while objective tests of knowledge or skills were rated as the second-to-least important. Time was the only barrier rated as important by more than half of respondents. Physicians expressed little desire for additional interprofessional education activities.

In general, our findings remained consistent across physician subgroups. Self-employed physicians reported doing more PD in their personal time and perceived a greater burden from the cost of PD activities, while those in academic practice provided higher priority scores for all PD competencies. Surgeons rated actual practice data as more important in identifying learning needs than did generalists or nonsurgical specialists. Longer-practicing physicians reported lower priority scores for medical knowledge/skills and practice/systems improvement, less of a barrier related to time and cost, and less desire for help identifying gaps. Most of the subgroup

Table 5

Barriers to Physicians' Professional Development, From a National Survey of U.S. Physicians, 2015–2016[a]

| Barrier | All respondents | | Mean rating by specialty[b] | | | |
	Mean (SD), median	Important, % (no./N)[c]	Gen	Surg	Spec	P
I don't have enough time.	3.5 (1.3), 4	54.4 (479/881)	3.7	3.4	3.5	.04
Professional development activities cost too much.	2.9 (1.3), 3	33.0 (291/883)	3.1	2.7	2.9	.02
It's hard to find high-quality, relevant activities.	2.4 (1.2), 2	17.2 (152/882)	2.3	2.4	2.4	.60
It's hard to get CME credit for my efforts.	2.2 (1.2), 2	14.7 (129/880)	2.3	2.1	2.2	.39
It's hard to access information when I need it.	2.2 (1.1), 2	13.3 (117/879)	2.2	2.2	2.1	.36
I'm not sure what is most important to learn about.	2.2 (1.1), 2	12.0 (105/875)	2.3	2.2	2.0	< .001
There isn't much new to learn.	1.5 (0.9), 1	4.4 (38/867)	1.5	1.7	1.5	.002

Abbreviations: SD indicates standard deviation; Gen, generalist (nonsubspecialist family medicine, internal medicine, and pediatric physicians); Surg, surgeon; Spec, nonsurgical specialist; CME, continuing medical education.

[a]Physicians rated each item in response to the question, "Over the past three years, how important have each of the following been as barriers to your overall professional development?" Response options ranged from 1 = not important at all to 5 = extremely important. Items are sorted in order of mean rating; see Supplemental Digital Appendix 6 (available at http://links.lww.com/ACADMED/A434) for the original item sequence and raw results.

[b]All differences in barriers across practice type were small and not statistically significant (P > .06).

[c]Important indicates a rating of very or extremely important.

differences we hypothesized were not statistically significant, and the higher priority scores provided by academic physicians ran counter to expectations (see Supplemental Digital Appendix 1, available at http://links.lww.com/ACADMED/A434).

Limitations and strengths

We do not know the attitudes of nonresponding physicians, and if those with strong beliefs preferentially responded, it could have biased our results. However, respondents and nonrespondents were similar across available demographic features, and the distribution of respondents' specialties aligned with that of U.S. physicians generally. Moreover, late respondents had attitudes similar to those who responded early. Insofar as those who responded late (i.e., after several reminders) have attitudes similar to those who never responded,[36] our findings do not underrepresent nonrespondents. Although this study provides useful information about physicians' beliefs regarding their PD needs and practices, it does not provide direct guidance on actual learning needs or potential systems-level solutions.

The large number of statistical analyses we conducted raises concerns about spuriously significant P values.[38,39] We view all of the analyses as exploratory and consider statistical significance as an indicator of potentially interesting relationships rather than as a reflection of certainty. For many subgroup analyses, we also outlined in advance our expected findings (see Supplemental Digital Appendix 1, available at http://links.lww.com/ACADMED/A434).

Strengths of our study include our adherence to best practices in survey development, implementation, and delivery, including pilot testing, expert review, and the use of a dedicated survey research center; a nationwide, cross-specialty sample that closely reflected U.S. demographics[37]; exploration of responses by specialty, practice type, and other subgroups; and ample power for these analyses.

Integration with prior research

Our findings align with the results of previous surveys indicating that time and/or schedule are the chief barriers to PD engagement,[24,26,27,40] that cost is a

moderate barrier,[24,26] and that physicians would continue CME even if they were not required to do so.[26] The findings from one survey agreed with our own regarding less desire among physicians for peer input or objective practice data,[24] while the findings from another conversely suggested that physicians want more feedback on their knowledge and clinical performance.[22] In an analysis reported separately, we found that physicians who responded to the present survey perceived low relevance and value in maintenance of certification (an important program for physician PD) as it is currently operationalized.[29]

Evidence indicates that physicians cannot reliably self-assess their own learning needs in general[14,17] and that they resist information that differs from their self-perceptions of competence.[7,41] However, individuals can recognize knowledge gaps when faced with a specific question,[42] suggesting that, in the moment of patient care, physicians might be able to recognize such gaps.

Our findings intersect with findings from previous research on clinical questions,[4,43] information seeking,[44,45] and point-of-care learning.[18,46,47] Physicians seek answers to only a minority of the questions that arise in clinical practice.[4,43] Our findings and those of prior research[43,48] suggest the need to better support physicians in quickly finding relevant information. Information technologies will likely play a key role in identifying gaps in knowledge and performance and in synthesizing, selecting, and delivering timely, relevant, accurate, and up-to-date information.[49–52]

Implications for practice and future research

Physicians' perceptions must be taken seriously. Even if responses like those we received reflect erroneous beliefs about barriers, self-assessment, professional priorities, or learning in general, they represent a starting point for discussions and activities that acknowledge—and if necessary correct—these beliefs.

Physicians reported that time is the greatest barrier to PD, followed by cost and difficulty finding relevant activities. Topic selection and accrual of CME credit were not viewed as problematic, although physicians would like credit for what they

Table 6

Subgroup Analyses of Key Items Related to Physicians' Attitudes Toward Professional Development, From a National Survey of U.S. Physicians, 2015–2016[a]

Demographic characteristics	Mean score				
	Competency: Medical knowledge/ skills	Competency: Practice/ systems improvement	Barrier: Time	Barrier: Cost	Attitude: Gaps
Specialty					
Anesthesiology	11.3	10.6	3.4	3.0	4.5
Diagnostic subspecialties	11.3	9.4	3.2	2.9	3.8
Family medicine	11.6	10.5	3.7	3.0	4.2
Internal medicine, general	12.1	10.8	3.8	3.2	4.3
Internal medicine subspecialties	12.4	10.9	3.7	3.0	3.8
Obstetrics–gynecology	11.9	11.4	3.4	2.7	4.2
Pediatrics	11.6	10.5	3.5	2.9	4.2
Pediatric subspecialties	12.1	10.3	3.8	3.0	4.0
Surgery and surgical subspecialties	11.3	10.8	3.4	2.7	3.9
Other clinical specialties	11.1	9.4	3.5	2.8	4.0
Generalist					
Nongeneralist	11.6	10.3	3.5	2.8	4.0
Generalist[b]	11.8	10.6	3.7	3.1	4.2
Gender					
Male	11.6	**10.1**	**3.4**	2.9	4.0
Female	11.6	**11.0**	**3.8**	3.0	4.2
Region					
Northeast	11.7	9.8	3.5	2.8	4.0
Midwest	11.3	10.1	3.5	2.8	3.9
South	11.4	10.2	3.6	3.1	4.1
West	12.2	11.2	3.5	2.9	4.2
Community size					
Rural	12.2	10.7	3.2	2.7	3.8
Urban	11.7	10.5	3.6	3.0	4.0
Practice type					
Self-employed	**10.7**	**9.5**	**3.4**	3.0	3.9
Group[c]	**11.8**	**10.4**	**3.5**	2.9	4.1
Academic	**12.3**	**11.3**	**3.8**	2.9	4.0
Burnout					
Emotional exhaustion	12.1	11.1	4.0	3.1	4.4
Depersonalization	11.4	10.8	4.0	3.2	4.2
Either emotional exhaustion or depersonalization	12.0	11.0	4.0	3.1	4.3
Years since training					
1–10	**12.5**	**11.0**	**3.9**	**3.1**	**4.4**
11–20	**11.4**	**11.5**	**3.9**	**3.0**	**4.3**
21–30	**11.2**	**9.7**	**3.4**	**2.8**	**3.8**
> 30	**11.6**	**9.4**	**2.9**	**2.7**	**3.8**
Practice size					
1 physician	11.2	9.7	3.5	3.1	4.1
2–5 physicians	11.2	10.2	3.3	2.8	3.8
6–25 physicians	12.0	10.4	3.6	3.0	4.1
> 25 physicians	11.7	10.9	3.7	2.8	4.2

(Table continues)

are already doing (i.e., workplace learning). Stating these barriers in positive terms, physicians desire time-efficient, low-cost, practice-relevant learning on topics of their choosing. Receiving CME credits may not be a strong incentive to participate in a given PD activity, especially one that appears to magnify other barriers (e.g., time, personal effort, or financial cost) or constrain physicians' choices of topic or approach.

Physicians generally did not want external help identifying their learning needs, preferring instead to rely on point-of-care questions, personal awareness, and practice updates. This attitude conflicts with what we know about self-assessment—namely, that people (physicians or otherwise) cannot accurately identify the things they do not know.[14,41] Actual practice data, guidance from others (an educational "coach"), and objective tests can more accurately identify true needs,[2,6,16] yet respondents rated these approaches as less important. Reconciling this disconnect remains an area of active research.

Physicians' prioritization of competencies in this study highlights two interrelated themes. First, CME providers need to understand the desires of potential participants (i.e., the topics physicians are interested in pursuing). Physicians' ratings of importance, difficulty in finding activities, and need to learn for specific competencies can inform such programmatic prioritizations. Second, identifying discrepancies between the competency prioritizations of experts and those of frontline physicians is important. Changes in both medical practice and the practice environment have dramatically affected all aspects of patient care, but perhaps these changes have not affected physicians' understanding of their own PD needs and preferences.[53,54] Our respondents rated medical knowledge/skills as the most important professional competency and of the overall highest priority. By contrast, professionalism and communication/ teamwork skills were of high importance but low learning need, suggesting that physicians believe that "these skills are important, but we already possess them and don't need to learn more." Overall, these findings highlight the differences between what physicians need for competencies, what they can access, and what they pursue.

Multidimensional needs demand multifaceted solutions. Identifying

Table 6
(Continued)

Demographic characteristics	Mean score				
	Competency: Medical knowledge/ skills	Competency: Practice/ systems improvement	Barrier: Time	Barrier: Cost	Attitude: Gaps
Compensation model					
Salary (fixed)	11.8	**10.4**	3.5	2.9	4.0
Salary with incentives	12.0	**11.1**	3.6	2.9	4.1
Productivity	11.1	**9.8**	3.5	2.9	3.9

[a]See Tables 2, 3, and 5 for estimates of variance (i.e., standard deviations) for the entire sample. Subgroup comparisons were exploratory, and we do not emphasize the statistical significances per se. To help identify subgroups with potentially meaningful variations, we have highlighted (in bold) the models with statistically significant differences ($P < .01$). Competency: Medical knowledge/skills indicates the priority score for the "Medical knowledge and skills" competency (range 1–25); Competency: Practice/systems improvement, the priority score for the "Practice and systems improvement" competency (range 1–25); Barrier: Time, responses to "I don't have enough time" (range 1–5); Barrier: Cost, responses to "Professional development activities cost too much" (range 1–5); and Attitude: Gaps, responses to "I would like more help identifying gaps in my professional abilities" (range 1–7).
[b]Generalist indicates nonsubspecialist family medicine, internal medicine, and pediatric physicians.
[c]Group indicates medical group, hospital, or government employer.

and addressing physicians' PD needs will require the integrated efforts of professional societies, certification boards, academic institutions, hospitals and health care delivery systems, specialists in point-of-care information delivery, and local communities of practice, among others.[2,6,8] Each entity has characteristics that make it better suited to address some needs and contexts and less suited to address others. Because physicians often encounter barriers when implementing change locally after learning something new,[55] the potential to support local practice change following a learning activity should be considered in addition to efficient content delivery and the effective promotion of learning.[6] Future research might explore how to objectively determine physicians' PD needs, share this information with physicians in a manner that engages rather than alienates them, and address gaps at individual, peer, interprofessional, and systems levels.

Our findings suggest that frontline physicians feel pushed to engage in activities that others believe are good for them, such as accepting guidance in determining their learning needs, training to work in interprofessional teams, and developing nonknowledge competencies. Although we agree with the need for PD/CME reform,[1–3,6,8,53,56] we suspect that a solely top-down approach will continue to meet resistance. Thus, we suggest that reform include efforts to transform the lifelong learning beliefs, attitudes,

and skills of frontline physicians such that they recognize the need for help identifying learning gaps, pursue activities that remedy these gaps, and accept that effective learning requires engagement and effort. The resulting demand-driven market will better support physicians in maintaining professional competence and delivering high-quality care.

D.A. Cook is professor of medicine and of medical education; associate director, Mayo Clinic Online Learning; director of research, Office of Applied Scholarship and Education Science; and consultant, Division of General Internal Medicine, Mayo Clinic College of Medicine and Science, Rochester, Minnesota.

M.J. Blachman is clinical professor, Department of Neuropsychiatry and Behavioral Science, and associate dean, Continuing Professional Development & Strategic Affairs, University of South Carolina School of Medicine, Columbia, South Carolina.

D.W. Price is senior vice president, American Board of Medical Specialties Research & Education Foundation, and executive director, American Board of Medical Specialties Multispecialty Portfolio Program, Chicago, Illinois, and professor of family medicine, University of Colorado School of Medicine, Aurora, Colorado.

C.P. West is professor of medicine, of biostatistics, and of medical education; associate program director, Internal Medicine Residency Program; and consultant, Division of General Internal Medicine, Mayo Clinic College of Medicine and Science, Rochester, Minnesota.

R.A. Berger is professor of orthopedics; dean, Mayo School of Continuous Professional Development; medical director, Mayo Clinic Online Learning; and consultant, Departments of Orthopedic Surgery and Anatomy, Mayo Clinic College of Medicine and Science, Rochester, Minnesota.

C.M. Wittich is associate professor of medicine; associate program director, Internal Medicine Residency Program; and practice chair, Division of General Internal Medicine, Mayo Clinic College of Medicine and Science, Rochester, Minnesota.

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