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RESEARCH ARTICLE

Preceptor perceptions of the layered learning practice model in a rural state

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Abstract

Background: Although the layered learning practice model (LLPM) was introduced to pharmacy residency practice over a decade ago, uptake has been slower in smaller community hospitals and practice settings, particularly in rural areas, compared to large academic teaching centres. This study investigates preceptor perceptions of the LLPM in a relatively rural state, seeking to assess whether findings replicate and extend prior work assessing various barriers and benefits associated with LLPM implementation. **Methods:** This was an observational, cross-sectional survey study of Arkansas preceptors. A survey was emailed to Arkansas pharmacy residency programme directors to distribute to their site preceptors between April and June 2023. **Results:** In a sample of 40 preceptors, findings showed that barriers to implementation were related to issues of resource, time, and learning constraints, and that benefits of implementation were related to issues of improved learning and opportunities for students. Most preceptors noted that implementing the LLPM took time away from other responsibilities and that managing multiple learners was a challenge. Preceptors also noted that greater didactic experiences and collaborative problem solving were benefits. Those who had postgraduate training experiences and/or had some experience implementing an LLPM were more inclined to note fewer barriers and greater benefits. **Conclusion:** Implementing the LLPM faces similar challenges today in a variety of practice settings compared to larger academic medical centres that reported these challenges previously.

Introduction

Educating the next generation of pharmacists in the experiential setting, especially where an attending pharmacist teaches students and residents hands-on practice, has been argued to be one of the most important aspects of the future of pharmacy (Delgado *et al*., 2014). Thus, empirical evidence surrounding precepting programmes and experiences matters. However, an international review of pharmacy preceptor training programmes (Knott *et al*., 2020) illustrated the wide variation in both the design and delivery of preceptor training programmes, a lack of general documentation of programmes in the literature, and a relatively small literature on evaluation.

Delgado *et al*. argued that "*In today's world of declining reimbursement, accountability for outcomes, and the constant pressure of doing more with less, it is imperative for pharmacy to significantly change its paradigm related to teaching*" (Delgado *et al*., 2014). As pharmacy residencies have become more available and precepting on rotations has become common practice, one teaching model, known as the layered learning practice model (LLPM), is being used more frequently both in the U.S. and globally (Loy *et al*., 2017; Chargualaf *et al*., 2019; Yung *et al*., 2019; Collins *et al*., 2023).

The LLPM was introduced into the pharmacy residency programme at the University of North Carolina over a decade ago (Bates *et al*., 2016a). Thus, this teaching model has proliferated well beyond very large academic medical centre settings. The LLPM is a

structured educational framework that takes a collaborative approach involving pharmacists, pharmacy residents, and pharmacy students to ideally optimise learning outcomes and improve patient care. A lead preceptor guides a layered learning experience with residents being in the middle layer of the education process between preceptor and student (Delgado *et al*., 2014; Bates *et al*., 2016b).

The immersive learning experience can take place in various healthcare settings, including hospitals, community pharmacies, and ambulatory care clinics. Pharmacy residents actively engage in patient care activities under the supervision of preceptors, gaining hands-on experience in medication management, drug therapy optimisation, and interprofessional collaboration while instructing, modelling, coaching, and facilitating the learning of pharmacy students. Through direct patient interactions and interdisciplinary teamwork, residents and students develop critical thinking skills and clinical judgement essential for effective pharmacy practice.

Several studies have explored various aspects, including effectiveness—and associated aspects of evaluation of effectiveness, such as perceptions—of the LLPM in enhancing pharmacy education and improving patient outcomes. Some studies report benefits with the LLPM, while others show no benefit. Soric *et al*. found that implementing an LLPM in a small community hospital reduced medication costs and increased patient satisfaction (Soric *et al*., 2016). Bates *et al*. found that using the LLPM at an academic medical centre improved clinical outcomes and measures (Bates *et al*., 2016b). Yung *et al*. found that implementing an LLPM in an oncology unit did not impact clinical productivity (Yung *et al*., 2019).

Study rationale

The literature specifically addressing preceptor perceptions of the LLPM is still in the early stages. For example, Prescott *et al*. (Prescott *et al*., 2020) surveyed the perceived benefits and barriers to an LLPM in Ohio and at big ten universities in a sample of 304 pharmacy preceptors, providing insight into how an LLPM potentially impacted pharmacy learners, practice sites, and patients, and that this information is important for preceptor development programmes. In this study, we aim to see if these findings are replicated and/or can be extended to the state of Arkansas, a more rural state with a total population of three million people and limited numbers of residency programme sites.

Methods

This was an observational, cross-sectional survey study. A survey was developed and emailed to all 22 Arkansas residency programme directors across the state to distribute to their varying numbers of preceptors. Almost two-thirds of the residency programmes were based around Little Rock (14 of a total of 22 = 63.6%), and University of Arkansas for Medical Sciences (UAMS) is the only academic medical centre in the entire state. The remaining eight residency sites are considered community hospitals, servicing Augusta, Batesville, Fayetteville, Jonesboro, Rogers, and Searcy. Additionally, the survey was distributed to UAMS pharmacy preceptors attending a professional development seminar for experiential education. Survey responses were collected between April and June of 2023. Inclusion criteria included all pharmacy preceptor and resident preceptor responses. Exclusion criteria were incomplete survey responses and any respondents with no precepting experiences. Survey questions asked about the preceptor's practice setting, years of precepting, completion of postgraduate training (e.g., residency or fellowship), types of pharmacy learners precepted, and whether they utilised the LLPM at their practice site. Questions surveyed the perceived benefits and barriers to an LLPM, which were replicated from Prescott *et al*. Each of the non-demographic questions was surveyed on a five-level Likert scale that ranged from Completely disagree to Completely agree. In order to make average descriptive comparisons, the following coding was adopted: "*1 = Completely Disagree, 2 = Somewhat Disagree, 3 = Unable to Assess, 4 = Somewhat Agree, 5 = Completely Agree*." There was also an open-ended question if respondents wanted to add any additional insights or opinions about the LLPM in relation to their experiences. The intended analyses were descriptive statistics using means and standard deviations. The analysis was purely item-by-item and descriptive, with no attempt to construct latent scales. Additionally, we report means and standard deviations and make comparisons between groups in terms of patterns, but these comparisons should not be interpreted as statistically significant differences, but rather as the general pattern of findings, in alignment with prior research in this area.

This study (#275754) was determined to be exempt from UAMS institutional review board (IRB) approval in April 2023. Participation was voluntary, and implied consent was provided by survey completion. Responses were collected anonymously, and no incentives were provided to survey participants. Data were stored on a secure server and were analysed in aggregate.

Results

A total of 40 preceptors out of 22 possible Arkansas residency programmes responded to the survey. The total number of possible respondents is unknown because the survey was sent to American Society of Health System Pharmacists (ASHP)-accredited residency programme directors to then distribute to their site preceptors, which varies by site and is not known to the authors. The demographics of the 40 preceptor survey respondents are summarised in Table I.

Table I: Preceptor demographics

Practice setting	
Inpatient hospital	24
Ambulatory care clinic	7
Community pharmacy	4
Academia	2
Rehabilitation facility	1
Managed care	1
Specialty pharmacy	1
Years of precepting	
0-1 years	9
2-5 years	14
6-10 years	8
11-20 years	6
21+ years	3
Completed postgraduate training	
None	15
PGY1 residency	21
PGY2 residency	5
Fellowship	2
MBA	1
Pharmacy learners currently precept	
IPPE students	14
APPE students	36
PGY1 residents	24
PGY2 residents	10
None (new to this)	1
Currently or have utilised a structured LLPM	
Yes	16
No	14
Somewhat	10

The majority of respondents (60%) practised in an inpatient setting, with most having two to five years of precepting experience. Most respondents had some form of postgraduate training (62.5%), with the majority completing a PGY1 residency. The preceptors reported that they currently precept mostly APPE students and PGY1 residents, and that most (65%) of them had experience utilising a structured LLPM in some capacity (including both those who responded somewhat and yes).

Overall, the greatest barriers to implementing the LLPM at their practice site (i.e., those with an average response above 3 = Unable to assess) were an inadequate number of workstations or computers or space, that the time required to precept multiple learners interfered with job responsibilities, their inability to effectively teach all levels of learners simultaneously, and their inability to oversee the patient care provided by multiple learners simultaneously (Table II).

The lowest barriers (those with a response at 2 or below) were related to medication safety, patient health-related outcomes, and limited access to drug information resources, indicating that these were the least areas of concern regarding implementing an LLPM at their practice site.

Overall, the greatest benefits to utilising the LLPM at their practice site (i.e., those with an average response of 4 or above) were the increased number of precepting opportunities for learners, increased opportunities for students to problem solve collaboratively, and improved ability to provide topic discussions or other didactic learning opportunities (Table II). None of the average responses was below 3 = Unable to assess, but the lowest three average responses regarding benefits of implementing the LLPM at their site were patient medication costs, pharmacist-generated revenue, and patient adherence. Table II below shows the mean and standard deviation (SD) of the various items, ranked by highest to lowest average rating.

Table II: Perceived barriers and benefits to implementing the LLPM

What are some barriers to implementing the LLPM at your site?	Mean	SD
Inadequate number of workstations or computers or space	3.80	1.20
Time required to precept multiple learners interferes with job responsibilities	3.70	1.20
Inability to effectively mentor all levels of learners simultaneously	3.15	1.35
Inability to oversee patient care provided by multiple learners simultaneously	3.10	1.32
Inability to effectively teach all levels of learners simultaneously	2.93	1.31
Decreased practice site efficiency	2.93	1.40
Other healthcare professional colleague buy-in to multiple learners at site	2.60	1.34
Inadequate number of patient care opportunities	2.40	1.34
Decreased patient satisfaction	2.30	1.11
Low leadership buy-in for having multiple learners at site	2.28	1.32
Decreased learner engagement onsite	2.28	1.18
Decreased pharmacist-generated revenue	2.08	1.19
Decreased medication safety	2.00	1.06
Worse patient health-related outcomes	1.95	0.96
Limited access to drug information resources for learners	1.73	1.01
What are some benefits to implementing the LLPM at your site?	**Mean**	**SD**
Increased number of precepting opportunities for learners	4.20	0.69
Increased opportunities for students to problem solve collaboratively	4.20	0.76
Improved ability to provide topic discussions or other didactic learning opportunities	4.05	0.93
Improved number of experiential training experiences to learners	3.98	0.95
Improved clinical knowledge gained by learners	3.98	0.97
Improved student comfort/ confidence in practice setting	3.95	0.96
Increased pharmacist visibility in the practice setting	3.93	0.92
Increased learner engagement onsite	3.90	0.87
Increased patient access to pharmacist or pharmacy learner	3.78	1.07
Improved patient education	3.75	0.95
Clinical service expansion	3.58	0.96
Improved patient satisfaction	3.55	0.85
Improved patient health-related outcomes	3.48	0.85
Enhanced medication safety	3.48	0.85
Improved practice site efficiency	3.35	1.17
Increased medication access	3.30	1.02
Improved patient adherence	3.28	0.99
Increased pharmacist generated revenue	3.23	1.12
Decreased patient medication costs	3.18	1.08

Note. 1 = Completely disagree, 2 = Somewhat disagree, 3 = Unable to assess, 4 = Somewhat agree, 5 = Completely agree. N = 40 (entire sample). Sorted by highest to lowest mean.

Tables III and IV examine the data broken down as a function of postgraduate training (e.g., residency, fellowship) and whether they are currently using the LLPM at their practice site in some capacity. The data was analysed as a function of postgraduate training, as we hypothesised that those having training experiences as a resident might impact their perceptions of the LLPM, and the data was analysed as a function of whether they are currently using the LLPM in their practice setting in some capacity for similar reasons.

Table III: Have you completed postgraduate training? (e.g., residency, fellowship) – Yes/No

What are some barriers to implementing the LLPM at your site?	Yes Mean (SD) N = 25	No Mean (SD) N = 15
Time required to precept multiple learners interferes with job responsibilities	3.64 (1.22)	3.80 (1.21)
Inadequate number of workstations or computers or space	3.88 (1.20)	3.67 (1.23)
Inability to effectively teach all levels of learners simultaneously	2.76 (1.33)	3.20 (1.26)
Inability to oversee patient care provided by multiple learners simultaneously	2.96 (1.31)	3.33 (1.35)
Inability to effectively mentor all levels of learners simultaneously	2.92 (1.35)	3.53 (1.30)
Decreased practice site efficiency	2.84 (1.49)	3.07 (1.28)
Inadequate number of patient care opportunities	2.08 (1.38)	2.93 (1.10)
Other healthcare professional colleague buy-in to multiple learners at site	2.32 (1.38)	3.07 (1.16)
Low leadership buy-in for having multiple learners at site	1.92 (1.22)	2.87 (1.30)
Decreased learner engagement onsite	1.96 (1.02)	2.80 (1.26)
Decreased patient satisfaction	1.88 (0.97)	3.00 (1.00)
Limited access to drug information resources for learners	1.48 (0.87)	2.13 (1.13)
Worse patient health-related outcomes	1.68 (0.85)	2.40 (0.99)
Decreased medication safety	1.68 (0.85)	2.53 (1.19)
Decreased pharmacist-generated revenue	1.76 (1.05)	2.60 (1.24)
What are some benefits to implementing the LLPM at your site?	**Yes Mean (SD) N = 25**	**No Mean (SD) N = 15**
Increased patient access to pharmacist or pharmacy learner	3.84 (1.14)	3.67 (0.98)
Increased number of precepting opportunities for learners	4.32 (0.63)	4.00 (0.76)
Improved patient education	3.88 (0.97)	3.53 (0.92)
Improved number of experiential training experiences to learners	4.20 (0.87)	3.60 (0.99)
Increased opportunities for students to problem solve collaboratively	4.32 (0.69)	4.00 (0.85)
Improved clinical knowledge gained by learners	4.16 (0.99)	3.67 (0.90)
Improved patient health-related outcomes	3.52 (0.82)	3.40 (0.91)
Clinical service expansion	3.56 (1.04)	3.60 (0.83)
Improved student comfort/ confidence in practice setting	4.00 (0.96)	3.87 (0.99)
Increased pharmacist visibility in the practice setting	4.08 (0.81)	3.67 (1.05)
Improved patient satisfaction	3.68 (0.85)	3.33 (0.82)
Improved ability to provide topic discussions or other didactic learning opportunities	4.12 (1.01)	3.93 (0.80)
Increased learner engagement onsite	3.96 (0.84)	3.80 (0.94)
Improved practice site efficiency	3.40 (1.26)	3.27 (1.03)
Improved patient adherence	3.28 (1.02)	3.27 (0.96)
Enhanced medication safety	3.52 (0.92)	3.40 (0.74)
Increased pharmacist generated revenue	3.28 (1.21)	3.13 (0.99)
Decreased patient medication costs	3.28 (1.10)	3.00 (1.07)
Increased medication access	3.44 (1.00)	3.07 (1.03)

Overall, the findings for those with postgraduate training vs. those without showed that, overall, those who had completed a residency or fellowship had lower perceptions of barriers across nearly all items (with the exception of the number of workstations, computers, or space item; see Table III). Correspondingly, those with postgraduate training were more likely to indicate higher ratings on perceived benefits. A very similar pattern emerged when comparing those who currently implemented an LLPM at their site vs. those that did not (see Table IV).

Table IV: Do you currently use the Layered Learning Practice Model (LLPM)? – Yes/No

What are some barriers to implementing the LLPM at your site?	Yes Mean (SD) N=26	No Mean (SD) N=14
Time required to precept multiple learners interferes with job responsibilities	3.58 (1.24)	3.93 (1.14)
Inadequate number of workstations or computers or space	3.96 (1.22)	3.50 (1.16)
Inability to effectively teach all levels of learners simultaneously	2.77 (1.37)	3.21 (1.19)
Inability to oversee patient care provided by multiple learners simultaneously	3.04 (1.34)	3.21 (1.31)
Inability to effectively mentor all levels of learners simultaneously	3.00 (1.41)	3.43 (1.22)
Decreased practice site efficiency	2.92 (1.52)	2.93 (1.21)
Inadequate number of patient care opportunities	2.31 (1.35)	2.57 (1.34)
Other healthcare professional colleague buy-in to multiple learners at site	2.31 (1.29)	3.14 (1.29)
Low leadership buy-in for having multiple learners at site	1.92 (1.20)	2.93 (1.33)
Decreased learner engagement onsite	2.00 (1.10)	2.79 (1.19)
Decreased patient satisfaction	1.96 (1.04)	2.93 (1.00)
Limited access to drug information resources for learners	1.58 (0.99)	2.00 (1.04)
Worse patient health-related outcomes	1.81 (0.98)	2.21 (0.89)
Decreased medication safety	1.73 (0.96)	2.50 (1.09)
Decreased pharmacist-generated revenue	1.85 (1.12)	2.50 (1.22)
What are some benefits to implementing the LLPM at your site?	**Yes Mean (SD) N=26**	**No Mean (SD) N=14**
Increased patient access to pharmacist or pharmacy learner	3.65 (1.20)	4.00 (0.78)
Increased number of precepting opportunities for learners	4.31 (0.62)	4.00 (0.78)
Improved patient education	3.73 (1.04)	3.79 (0.80)
Improved number of experiential training experiences to learners	4.12 (0.95)	3.71 (0.91)
Increased opportunities for students to problem solve collaboratively	4.42 (0.58)	3.79 (0.89)
Improved clinical knowledge gained by learners	4.19 (0.94)	3.57 (0.94)
Improved patient health-related outcomes	3.42 (0.81)	3.57 (0.94)
Clinical service expansion	3.58 (0.95)	3.57 (1.02)
Improved student comfort/ confidence in practice setting	4.08 (0.89)	3.71 (1.07)
Increased pharmacist visibility in the practice setting	4.00 (0.94)	3.79 (0.89)
Improved patient satisfaction	3.58 (0.90)	3.50 (0.76)
Improved ability to provide topic discussions or other didactic learning opportunities	4.23 (0.91)	3.71 (0.91)
Increased learner engagement onsite	3.96 (0.96)	3.79 (0.70)
Improved practice site efficiency	3.35 (1.23)	3.36 (1.08)
Improved patient adherence	3.15 (1.08)	3.50 (0.76)
Enhanced medication safety	3.38 (0.85)	3.64 (0.84)
Increased pharmacist generated revenue	3.04 (1.22)	3.57 (0.85)
Decreased patient medication costs	3.12 (1.18)	3.29 (0.91)
Increased medication access	3.23 (1.11)	3.43 (0.85)

A note for comparison between Table II and Table III is that the "*Yes*" category included those who indicated they were using the LLPM at least "*somewhat*" or answered "*Yes*." In one case, a Yes was someone who responded "*I have in the past*." The majority of residency trained pharmacists used the LLPM (only six who had no postgraduate training used the LLPM). On the flipside, three residency and two fellowship trained pharmacists said they did not use the LLPM. This may, at least in part, account for the large overlap between general findings across these two groups.

When asked whether they had "*Any additional comments for our consideration?*" there were only a handful of responses. Mainly, comments were about perceived barriers. For example, one comment was about space constraints: "*Would love to implement more if I can gain space for learners*." Another was about limitations in resources or capacity: "*Unfortunately this really doesn't apply to my practice site, however I find this very interesting. A independent community site would not utilize this due to opportunity and not even having multiple students at a time."*

The other set of comments largely focused on the challenges of implementing the LLPM appropriately, for example, one respondent noted the LLPM was "*Hard to layer for non-clinical rotations*." Another noted that the "*Current model is very limiting, especially for rotations that do not have multiple rotation opportunities. Not fair to a resident who chose to be there to learn from a clinical specialty standpoint vs. a student who likely was just placed there by chance and may not have any interest in that particular career path*." A longer response pointed out, in part, that one important issue was the "*Scheduling of LLPM with PGY-1 and APPE. At what point in the PGY-1 year may make a difference. Introducing students during the second half of a PGY-1 learning experience so that resident may teach APPE student, vs. dedicated PGY-1 learning experience where the PGY-1 resident is functionally the preceptor for the APPE student towards the end of the PGY-1 year*."

Discussion

These findings show that the major perceived barriers to LLPM implementation of preceptors mainly have to do with issues of resource, time, and learning constraints, and that the major perceived benefits are increased opportunities for learning, collaborative problem solving and experiences for students and residents. It's also important to note that most of these barriers are based on functionality and logistics versus that the LLPM is not beneficial. These findings replicate those of Prescott *et al*., showing perceptions of the LLPM extend to various contexts, including a relatively rural state (Prescott *et al*., 2020). The major barriers revolved around resource constraints, namely, a lack of adequate workstations and space, time required for precepting took away from other job responsibilities, and the time required to oversee multiple learners at the same time was a challenge. The major benefits were greater opportunities for learners and for learners to solve problems collaboratively. Overall, the LLPM took time away from other job responsibilities, but preceptors felt that the LLPM also provided greater opportunities for students and residents.

An important context to interpret these findings is that there are only 51 total residency positions at 22 residency programmes across the entire state of Arkansas (41 PGY1 spots and 10 PGY2 spots). Many of the residency programme sites are clustered in more population dense areas, such as Little Rock (14/22 = 63.6%). Thus, in contrast to findings from larger academic medical centres such as those from Prescott *et al*., the lack of implementation of the LLPM may be, at least in part, a function of limited capacity due to a lack of residency positions dispersed across the state, and the findings about the LLPM are largely from the Little Rock area (Prescott *et al*., 2020).

We also extend the findings of Prescott *et al*. by examining differences between those who currently implemented the LLPM at their practice site vs. those who did not, and those who were residency or fellowship trained vs. those who were not (Prescott *et al*., 2020). Overall, those who were already implementing the LLPM and those who were residency trained perceived fewer barriers and greater benefits of the LLPM. There was also variation across the perceived barriers and benefits of the LLPM. No statistical analyses were run on these between group differences with small sample sizes, and therefore the results should be interpreted largely as hypothesis generating. However, the pattern is worth noting and may be an area of education and opportunity for those who have never used the LLPM or were not residency trained. Regarding barriers (Table II), the rank order in our study compared to Prescott *et al*. is strikingly similar, and thus replicates (Prescott *et al*., 2020). However, for benefits (Table II), in our study improved patient education and improved patient health-related outcomes were ranked much lower than in Prescott *et al*., whereas improved ability to provide topic discussions or other didactic learning opportunities were ranked among the top items for our sample (Prescott *et al*., 2020). Thus, at least based on perceptions, benefits of the LLPM were more related to student rather than patient outcomes, at least in our sample.

Limitations and future directions

One limitation is that the sample was limited to those survey respondents across UAMS pharmacy preceptors who responded to the survey. Given that it is not possible to determine whether those who responded had different affinity with the LLPM, had more time on their hands, or other aspects, means the sample may not be representative. We also had a relatively small sample size.

Another limitation is that when addressing the issue of programme evaluation of the LLPM, this study only

looked at the perceptions through a survey from pharmacy preceptors. This means that perceptions from students, residents, or other stakeholders were missing. Previously published studies on the LLPM with pharmacy learners have shown benefit, while other studies showed no benefit. Soric *et al*. implemented the LLPM in a small community hospital where learners provided medication education, reduced medication costs, and increased patient satisfaction (Soric *et al*., 2016). Bates *et al*. found that using the LLPM to provide discharge medication reconciliation and education at an academic medical centre improved clinical outcomes and measures (Bates *et al*., 2016b). However, Yung *et al*. found that implementing an LLPM in an oncology unit did not impact clinical productivity (Yung *et al*., 2019). Additionally, though some research has been conducted on the effectiveness of the LLPM, as noted earlier, the findings have been mixed, and the research designs do not come close to a randomised controlled trial. Thus, there are many possibilities for future research in this area.

Conclusion

Changing the learning model for pharmacy students to be up to date with the evolving demands of the profession is an ongoing challenge, but one that likely must be met by seeking to test and examine new models of training, such as the LLPM. In a relatively rural state, we examined one aspect of evaluating the LLPM model: perceptions of preceptors regarding various barriers and benefits to implementation. Though these perceptions cannot fully evaluate the LLPM and broader outcomes, this does add to the literature on perceptions and evaluation of the LLPM more broadly, replicating and extending prior work (Prescott *et al*., 2020). As postgraduate training increasingly becomes the widespread norm across the pharmacy profession, finding ways to improve the learning experiences for all roles in the LLPM, as well as balancing the concerns regarding the already heavy demands of practising pharmacists who may be involved in the LLPM teaching experience, are ongoing tensions that individual residency practice sites will need to address.

Conflict of interest

The authors declare no conflict of interest.

Source of funding

The authors did not receive any funding.

Ethics approval and informed consent

This original research project was determined to be exempt from full review by the UAMS Institutional Review Board.

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