Training and Performance Differences in US Internal Medicine Residents Trained in Community- and University-Based Programs – a Systematic Review

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Abstract

Introduction:

Residents' learning and performance depends on program structures, clinical setting and faculty mentors; however, performance differences between and community based vs. university based residents have not been explored systematically.

Objectives:

To systematically review the performance differences between internal medicine residents trained in community-based programs [CBPs] versus university-based programs [UBPs] in the US.

Methods:

Eligible studies were identified in Medline and Embase databases from 1990- June 2018. Eligible studies compared learning and performance differences between UBP and CBP internal medicine residency programs aligned with ACGME recommendations.

Results:

Out of 4916 titles, 14 cross-sectional studies were included in the analysis. Diverse reporting among the included studies precluded meta-analysis. Significant differences were found in specific practice areas, such as knowledge about HIV, nutrition training, and program accreditation cycle. Residents in UBPs participated more often in hypothesis driven research and had higher publication rates than residents in CBPs. Residents trained in CBPs experienced more burnt out than those in UBPs and had higher prevalence of residents with problematic behaviors and deficiencies. Nonsignificant differences were found among residents regarding ABIM pass rate, medical procedures, and public health training.

Conclusion:

Our review reports inconsistent trends in residents' learning and performances following RRC- IM and ACGME recommendations. Significant differences were noted in areas that required more practice and system based learning, non-procedural skills and patient care. Future studies with larger sample sizes and adjusted analyses are needed to evaluate the difference between residents' performance and learning in UBPs versus CBPs.

Keywords: Internal medicine residency, university based program, community based program, ACGME recommendations, scholarly activity, performance differences

1. Introduction

The goal of residency training is to develop residents' abilities to employ competency based learning, resource management and decision making, thinking to enhance patient safety and overall population health (Combes, & Arespacochaga, 2012). To achieve these goals, residents need to be confident in their learning abilities, engage in scholarly activities, and keep abreast with changes in practice. A resident's intrinsic motivation for learning plays a key role in their success, but factors such as, clinical exposure, faculty/mentor availability, and technical support and

resources can also shape resident's training (Genn, 2001; Hoff, Pohl, & Joel., 2004). In 1994, the Residency Review Committee for Internal Medicine [RRC-IM] took initiative to promote learning opportunities for residents (Alguire, Anderson, Albrecht, & Poland, 1996). In 2011, The Accreditation Council for Graduate Medical Education [ACGME] recommended medical educators and residency program directors to incorporate more competency based learning opportunities in residency programs (Combes, & Arespacochaga, 2012; Nasca, Day, & Amis, 2010; Nasca, Philibert, Brigham, & Flynn, 2012). These recommendations were aimed to increase residents' abilities to practice evidence based medicine [EBM] and patient centered care (Goodman, 1994; Schultz, 1996; Potti, Mariani, Saeed, & Smego, 2003) that meet societal needs and expectations by the end of their training (Antiel, Thompson, & Reed, et al. 2010; Chaudhry, Lien, Ehrlich, Lane, Cordasco, et al, 2014).

In the US, residency training is categorized as a university based program [UBP] or a non-university based program, such as a community based program [CBP]. Both program types differ in terms of size, clinical sites, workload, level of supervision and funding resources (Genn, 2001; Hoff, Pohl, & Joel, 2004). As a result, residents may learn in a different clinical environment and acquire different skills depending on their enrolled training. Inadequate clinical skills and medical knowledge at the end of residency training are major concerns in health care system (Chaudhry, Lien, Ehrlich, Lane, Cordasco, et al, 2014; Lyn, Hess, Weng, Lipner, & Holmboe, 2012; Blumenthal, Gokhale, Campbell, & Weissman, 200). A recent survey (Antiel, Thompson, & Reed, et al. 2010) found that program directors of the small CBPs were less enthusiastic than UBP to adopt new ACGME recommendations. Since residents are key collaborators and ambassadors for their community, hospital, and teaching institute, it is imperative to explore the impact of new ACGME recommendations in improving the learning and practice patterns for residents across UBPs and CBPs. Evaluating the training differences between CBPs and UBPs will provide an understanding of the community-based distributive medical education [CBDME] (Farnsworth, Frantz & McCune, 2012) and inform optimal training opportunities for residents that may better meet societal needs and expectations. The objective of the review is to systematically explore performance difference, differences in residents learning opportunities and skills acquired during training between CBP and UBP residents.

2. Methods

We searched in Medline and Embase from 1990- June 2018 using key words and mesh terms that were identified with the "Yale Mesh word Analyzer" [http://mesh.med.yale.edu/]. Bibliographic references of included articles were also searched for additional eligible studies. Search terms were broad and were categorized in to four categories to capture eligible studies (Table 1). Terms in each category were combined with "OR"; whereas each category was combined with "AND". We restricted our search to studies that reported in English to focus on internal residency programs in the US. The criteria for inclusion were a cross sectional observational study design that explored outcomes in alignment with ACGME recommendations. RCTs, systematic reviews, qualitative studies, commentaries, editorials, and conferences abstracts were excluded. Studies exploring clinical skills/outcomes in practicing physicians, medical students and/or clinical clerks were excluded. Studies were also excluded if the study compared performance differences between UBPs and CBPs in multiple specialties but did not report results separately for internal medicine programs. All articles were reviewed in duplicate and independently during title and abstract screening, full text screening, data abstraction and quality of study. Extracted data were tabulated and examined for interpretation.

Table 1: Search Term- Medline

Program Related terms	Terms related to ACGME related outcomes	Terms- Study designs	Terms related US
• University-Based Residency Training.mp.	• Accreditation Council for Graduate Medical Education.mp.	• exp "Surveys and Questionnaires"/	• exp United States/ep [Epidemiology]
• exp "Internship and Residency"/ed, mt, og, st, td [Education, Methods, Organization & Administration, Standards, Trends]	• ACGME.mp. • exp Education, Medical/ • Education, Medical.mp. • exp Clinical Competence/ • Clinical Competence.mp. • exp Teaching/ • Mentor.mp. • supervisor.mp.	• National survey.mp. • exp Retrospective Studies/ or exp Cross-Sectional Studies/ • Retrospective cross sectional study design.mp.	• USA.mp. • US.mp. • America.mp. • America*.mp.
• Non-university based program.mp.			

- community-based program.mp.
- exp Hospitals, Community/og, sn, td [Organization & Administration, Statistics & Numerical Data, Trends]
- residency training.mp.
- residency program.mp.
- exp Hospitals, University/og, st, sn, td [Organization & Administration, Standards, Statistics & Numerical Data, Trends]
- Hospitals, University.mp.
- exp Internal Medicine/ed [Education]
- general medicine residency.mp.
- internal medicine residency.mp.
- American Board of internal medicine.mp.
- ABMI.mp.
- (community based adj5 university based).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]
- exp HOSPITALS, TEACHING/ed, mt [Education, Methods]
- teaching hospital.mp
- Community-based distributive medical education.mp.
- Practice pattern.mp.
- exp Curriculum/
- Program characteristics.mp.
- Residency review committee.mp.
- exp interpersonal communication/ or exp communication skill/ or exp doctor patient relation/
- communication skills.mp
- Practice-based learning.mp.
- Systems-based practice.mp.
- Resident scholarship.mp.
- residency education/
- exp professional competence/ or exp medical ethics/ or exp professionalism/ or exp medical profession/ or exp health care quality/ or exp professional practice
- Medical knowledge.mp.
- Patient care.mp.
- exp patient care/
- distributive medical education model.mp
- exp medical practice/ or exp health care delivery/
- exp Observational Study/ or exp Prospective Studies/
- Observational study.mp.
- exp medical information/ or exp knowledge/
- Terms in each category were combined with *"OR"*
- each category was combined with *"AND"*

2.1 Important Definition

2.1.1 Residency Outcomes: Residency outcomes that aligned with ACGME recommendations, such as patient care, medical knowledge, professionalism, systems-based practice, practice-based learning, and communication skills in general internal medicine programs (Table 2). We used the same definitions as by Catalanotti et al (Catalanotti, Popiel, Duwell, Price, & Miles, 2014) to define ACGME outcomes. Any behavioral issues such as difficulty or challenges that could affect resident's performances and hinder in meeting programs standards were categorized in to professionalism (Brenner, Mathai, Jain, & Mohl, 2010).

Table 2. Definition of Outcomes According to ACGME Recommendations

Outcome (ACGME based recommendations)	**Definition**
Patient care and safety	Treatment focused on prioritizing patients care plan, diagnostic strategies and cost effectiveness.
Medical knowledge	Knowledge and skills required to successfully perform any medical procedure, to develop management plan and/or to understanding about the diagnostic test.
Practice-based learning	Skills or strategies used to improve the quality of patient care and its delivery.
Interpersonal and communication skills	Ability to develop therapeutic relationship with persons of diverse socioeconomic backgrounds
Professionalism	A role model and consistent respect for patient's unique characteristics and needs
Systems-based practice (SBP)	Resident's ability to use appropriate resources, taking initiative to deliver effective health care and mitigate the barriers to cost effectiveness.

2.1.2 University-Based Programs*:* were defined as programs administered by a department of medicine and integrated with university programs. *Non-university-based programs* were all other programs, including those at Veterans affairs [VA], community hospitals [university-affiliated or independent]. We chose to divide programs this way because 1] we believed that university-based programs were more likely to have resources pertinent to research and 2] we wanted our data to be comparable with that in previously published studies.

2.1.3 Study Quality: We evaluated study quality according to the Medical Education Research Quality Instrument [MERSQI] (Reed, Cook, Beckman, Levine, & Kern 2007), which considers the type of outcomes, research design, sampling strategy, and data collection and analysis procedures (Reed et al 2007).The MERSQI scoring system was previously used in systematic reviews evaluating the quality of the included studies (Ahmed, Devitt, & Keshet, et al. 2014; Bolster, & Rourke, 2015). The MERSQI has a maximum score of 18, with 9.8 as an average score. For this review, any study that employed a previously validated questionnaire was considered an objective measure of outcome. In terms of statistical analysis, multivariable adjusted analysis [MVA] was considered appropriate for study type. Thirdly, studies that did not analyze outcomes of interest with MVA or that only reported a P value for two groups were considered as descriptive analysis/reporting.

2.2 Data Analysis and Reporting

Study characteristics were reported descriptively. We extracted data such as odd ratios with 95% CI, beta-coefficients [B], standard error, and P-values. We also extracted proportions if author reported only proportions to describe differences in performance or skills between residents.

3. Results

Our initial search yielded 4866 title and abstracts, of which14 studies were eligible [PRISMA flow Chart] **(**Moher, Liberati, Tetzlaff, Altman, the PRISMA Group et al. 2009). The characteristics of included studies are reported in *table#3*. All included studies were multi-site, cross-sectional surveys. The median sample size for the included studies were 287.5 [range=127-444]. Among the included studies, outcome of interest was categorized by any of the following: medical knowledge [n=2] (Hicks, Gonzales, Morton, Gibbons, Wigton et al. 2000; Atsawarungruangkit et al, 2015); faculty encouraging counseling/ training [n=2] (Berkenblit, Sosman, & Bass, et al. 2012; Catalanotti et al. 2014); patient safety and care [n=4] (Schultz et al. 1994; Jain, Wyatt, Burke, Sepkowitz, & Begier, 2009; Young, E., Stickrath, McNulty, Calderon., Chapman, et al., 2016; Khandelwal, Zemore, & Hemmerling, 2018); professionalism-residents well being [n=2] (West CP., Halvorsen, Swenson & McDonald, 2013; Elmariah, Thomas, Boggan, Zaas, & Bae J, 2017); problem residents [n=2] (Yao, & Wright, 2000; Dupras, Edson, Halvorsen, Hopkins, & McDonald, 2012); resident's scholarly activity [n=1] (Levine, Hebert, & Wright, 2005); program based characteristics [n=1] **(**Chaudhry, Caccames, & Beasley, 2009).

Table 3. Summary Characteristics of Included Studies

Author	**Number of participants**	**University based program**	**Community based program**	**Community-University affiliated based program**	**Other Others**
Atsawarungruangkit 2015	Programs (n= 295)	106 (35.93%)	32 (10.85%)	156 (52.88%)	1 (0.34%)
Berkenblit 2012	Residents (n= 335)	200 (59.7%)	96 (28.7%)	-	39 (11.6%)
Catalanotti 2014	Programs (n=127)	36.2%	8.7 %	47.2 %	7.1
Chaudhry 2009	Programs (n= 272)	74 (30%)	139 (56 %)	-	17 (7%)
Dupras 2012	Programs (n= 268)	86 (32.1%)	35 (13.1%)	143 (53.4%)	4 (1.5%)
Elmariah 2017	Residents (n= 211)	100 (11%)	28 (3%)	-	105 (11%)
Hicks 2000	Residents (n= 196)	2 (n= 140)	N= 31	-	1 (n= 25)
Jain 2009	Residents (n= 444)	115 (25.9%)	69 (15.5%)	260 (58.6%)	-
	Programs Directors (n= 15)	10 (66.7%)	2 (13.3%)	3 (20.0%)	-
Khandelwal2018	Residents (n= 133)	46(34.58)	33 (24.81%)	46 (34.58)	-
	Educators (n= 40)	14 (35.0)	5 (12.5)	19 (47.5)	2 (5.0)
Levine 2005	PD (n= 391)	Not reported	Not reported	Not reported	Not reported
Schultz 1994	Residents (n= 293)	133 (76%)	28 (16.18%)	-	-
West 2013	PD (n= 282)	99 (35.1)	34 (12.1)	143 (50.7)	6 (2.1)
Yao 2000	PD (n= 268)	37%	58%	-	5%
Young 2016	Residents (n=469)	447 (95.3%)	22 (4.7%)	-	-

3.1.1 Quality of the Included Studies

Quality assessment of included studies is reported in *Table# 4*. The average score for the included score was 11.7 [range= 8.5-15]. All studies except for three (Hicks, 2000; West et al 2013; Khandelwal et al 2018) had a response rate of less than 75%. Most studies used previously validated tools or questionnaires to measure outcomes except for four studies (Schultz 1994, Hicks, 2000, Jain et al 2009; Atsawarungruangkit 2015) did not meet all three criteria for validity of evaluation of instruments. One study (Atsawarungruangkit et al 2015) measured pass rate for ABIM certification from data collected by an online source, precluding analysis of relationships with other variables. Eight studies did not used adjusted analysis or reported data descriptively (Berkenblit et al. 2012; Jain et al 2009; Young et al 2016; Catalanotti et al. 2014; Elmariah et al. 2017; Yao et al 2000; Levine et al. 2005; Elmariah et al 2017; Dupras et al. 2012; Catalanotti et al. 2014). None of the included studies evaluated public health outcomes. Four studies (Elmariah et al 2017, West et al. 2013***;*** Dupras et al. 2012; Yao et al. 2000) explored outcomes relevant to residents' behaviors; two studies (Hicks, 2000; Atsawarungruangkit 2015) explored knowledge and skills related outcomes, and whereas eight studies (Schultz et al 1994; Levine et al. 2005*;* Chaudhry et al 2009; Jain et al 2009; *Berkenblit 2012;* Catalanotti et al. 2014; Young et al. 2016; Khandelwal et al. 2018) explored residents satisfaction, attitude and perception related outcomes.

Table 4. Quality of Included Studies

Domain	MERSQI	Atsawarungruangkit 2015	Berkenblit 2012	Jain 2009	Schultz 1994	Khandelwal2018	Catalanotti 2014	Chaudhry 2009	Elmariah 2017	West 2013	Levine 2005	Hicks 2000	Dupras 2012	Yao 2000	Young 2016
Study design	Cross-sectional (=1); Single group pretest & posttest (= 1.5); Nonrandomized, 2 groups (=2); RCT (=3)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Sampling	# of Institutions studied: 1 (=0.5); 2 (= 1); 3 (= 1.5)	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
	Response rate, %: <50% (0.5); 50-74% (= 1); >75% (1.5)	1.5	0.5	0.5	1	0.5	0.5	1	0.5	1.5	1	1.5	1	1	1
Type of data	Assessment by participants (=1);	3	3	1	1	1	3	3	3	3	3	1	3	1	1
	Objective measurent (=3)														
Validity of evaluation instrument	Internal structure: Not reported (= 0); reported (=1); Not applicable= NA	1	1	1	0	1	1	1	1	1	1	1	1	1	1
	Content = Not reported (= 0); reported (=1); Not applicable= NA	1	1	1	0	1	1	1	1	1	1	1	1	1	1
	Relationships to other variables: Not reported (= 0); reported (=1); Not applicable= NA	NA	1	0	0	1	1	1	1	1	1	0	1	1	1
Data analysis	Appropriateness of analysis (Yes= 1)	1	1	1	1	1	0	1	0	1	0	1	0	0	0
	Descriptive analysis only (=1)	2	2	2	2	2	1	2	1	2	1	2	1	1	2
Outcomes	Satisfaction, attitudes, perceptions (=1); knowledge skills (=1.5); behavior (=2); patient health outcome (=3) ,	1	1	1	1	1	1	1	2	2	1.5	1.5	2	2	1
Total	**Average= 11.7**	**12**	**13**	**10**	**8.5**	**11**	**11**	**13.5**	**12**	**15**	**12**	**11.5**	**13.5**	**10.5**	**10.5**

3.2 ACGME Recommended Outcomes

Outcome descriptions are reported in *table 5*.

Table 5. Outcomes from the Included Studies

Author	Outcome	Comments
Medical Knowledge and procedural outcomes		
Atsawarungruangkit 2015	Pass rate of ABIM certifying exam	In univariate analysis residents in UBP [((SE) = 2.2413 (1.0889); P= 0.040)] were more likely to pass ABIM certification exam than CBP. In multivariate analysis no significant difference was noticed between CBP, UBP and VA programs
Hicks 2000	Comfort level with medical procedural experience by the completion of IM residency	In multivariable analysis, training in the UBP was associated with less comfort for skin biopsy [OR (95%CI) = 0.39 (0.11, 0.76)]. In descriptive analysis, for performing medical procedure resident in UBP met ABIM expectation on arterial blood gases (ABG) than CBP (P= 0.001). Performance in other procedures such as paracentesis, central venous pressure line, flexible sigmoidoscopy, knee aspiration, lumbar puncture, pelvic exam, and thoracocentesis was not significant.
Practice & system based learning/ practice - Counseling and training outcomes		
Berkenblit 2012	Encouraging Trainees to Perform Routine HIV Testing	Residents in VA [OR (95%CI) = 0.32 (0.13, 0.84)] were less likely to screen for HIV on routine. no significant differences between UBP (REF-category) and CBP programs[OR (95%CI) = 0.90 (0.42, 1.93)] were noted
Catalanotti 2014	Offering public health training to residents and residents interest in public health training, satisfaction,	In descriptive analysis, UBP offered more public health training to residents than CBP (83% vs. 52%) and 54% in university affiliated community programs.
Patient safety and care		
Jain 2009	Routine/ voluntary HIV testing, knowledge, attitudes,	No significant difference between UBP [OR (95%CI) = 1 (0.3–3.5)] and CBP programs (REF- category) and community- university affiliated hospitals [OR (95%CI) = 1.6 (0.7–3.9)]
Schultz 1994	Knowledge of HIV care	In multivariable analysis, significant differences between UBP vs., CBP (P= 0.02). Residents performed demonstrated relatively poor knowledge on questions regarding HIV drugs and risk factors such as risk factors or cervical cancer
Khandelwal 2018	Nutritional counseling practices	Residents in CBP offered more nutritional counseling's to patients than patients in UBP (P=< 0.001). Residents in CBP used >3 different strategies to provide nutritional counseling's to patients (75% vs. 28.3%). In multivariate analysis; no significant difference between CBP vs. UBP was noted for frequency of nutritional counseling (B= -0.010; SE= 0.17; P= 0.32,).
Young 2016	Residents' perceived responsibility for patient care	No significant difference in perceived responsibility between participants from UBP and CBP (correlation coefficient 0.05, P = 0.28).
Professionalism		
Elmariah 2017	Burnout Severity	In descriptive analysis, the mean score for CBP (3.31) vs. UBP (3.21); VA (3.67); P= <0.001
West 2013	Burnout Severity	In a descriptive analysis, residents in CBP experienced higher depersonalization than UBP (23.5 vs. 8.6%; P= 0.01). In Multivariate analysis, increased working hours were associated with depersonalization
Dupras 2012	Problem resident	In descriptive analysis, CBP had 62% higher odds of problem residents than UBP (P= 0.001)
Yao 2000	Problem Residents	In descriptive analysis, CBP program had higher prevalence of problem residents than UBP (8.1% vs. 5%; P= 0.001). Residents in UBP had higher prevalence of depression (30% vs. 19%).
Residents scholarly activities:		
Levine 2005	Resident scholarly activities such as research curriculum, research activities, faculty support, research funding, publish in peer-reviewed Journals.	In descriptive analysis, CBP had higher research related curriculum (P= 0.05), research mentors (P= <0.001), case report (P= 0.04), higher rate for attending local and regional conferences (P= 0.01) and mandatory research activities (P= 0.03). UBP had higher citation rate (P= 0.002); publication in peer review journals (P= 0.02); topic review presentations (P= 0.002). Non significant factors were: Research committee, present at national meetings, Protected time for research, Research directors and funding
Program organizational factors:		
Chaudhry 2009	Program accreditation cycle	In multivariate analysis, UBP had shorter accreditation cycles than CBP (B= - 0.15; P= 0.018) and community based- teaching faculty [the proportion of program faculty who were community based voluntary teachers; (*P*= 0.003)].

3.2.1 Medical Knowledge- Pass Rates

One study (Atsawarungruangkit et al., 2015) explored difference in pass rate for ABIM certification exam between CBPs and UBPs. Univariate analysis revealed that residents in UBPs were twice as likely to pass ABIM [B = 2.2413; SE= 1.0889]; P= 0.040] than residents in CBPs or other program types. No significant associations were found in the multivariate analysis.

One study (Hicks et al., 2000) explored residents' expertise in performing medical procedures. A significant difference was found among residents in UBPs and CBPs that performed procedures for arterial blood [ABG; P= .02]. Performances on all other procedures such as paracentesis, thoracocentesis, CVP, sigmoidoscopy, arthroscopy were not significant between UBP and CBP residents. In multivariable analysis, training in the UBP was associated with less comfort for skin biopsy [OR [95% CI] = 0.39 [0.11, 0.76]].

3.2.2 Practice and System Based Learning and Training Opportunities by Programs and Faculty

Catalanotti et al (2014) explored the difference between training opportunities offered by program directors. UBPs were more likely to offer public health training [PHT] to residents than CBPs [83% vs. 52%]. Among CBPs, 55% offered longitudinal training and experiences and 82% [54/66] offered short-term experiences. Programs that did not offer PHT to residents reported that <10% residents in program were interested in PHT [P= 0.022].

Berkenblit et al (2012) explored faculty's role in encouraging residents to provide screening and counseling to patients. There were no significant differences in faculty's role to encourage residents to employ HIV counseling. However, residents at VA programs offered less HIV counseling to patients [OR [95%CI] = 0.32 [0.13, 0.84]].

3.2.3 Patient Safety and Care

Three studies (Schultz et al., 1994; Khandelwal et al., 2018; Young et al., 2016) explored residents practice about HIV counseling and knowledge about HIV screening. Outcomes of two studies (Schultz et al., 1994; Young et al., 2016) met the description for patient safety and care. Shultz et al (1994) reported significant differences in terms of poor knowledge on questions regarding HIV drugs and risk factors such as risk factors or cervical cancer [P= 0.02] between UBP and CBP; however authors did not report, residents of which program had poor knowledge about HIV counseling. Jain et al (2009) published post ACGME 2003 recommendations, reported no significant difference between UBP and CBP programs.

One study (Khandelwal et al., 2018**)** explored resident's attitude towards nutritional counseling during residency training and explored the frequency and methods employed for nutritional counseling between UBPs and CBPs residents. Residents trained in UBPs used more methods for nutritional counseling than CBPs [P=< 0.001]. Faculty members at UBPs also encouraged residents more often to employ nutritional counseling. Frequency of nutritional counseling was not significant for program types. Young et al (2016) explored differences in residents' perception and responsibility about patient care on discharge, but no significant difference was found between UBP and CBP [P = 0.28].

3.2.4 Professionalism- Resident Well-Being- Work Load/ Burnt out Status& Problem Residents

Two studies (Elmariah, 2017; West et al., 2013) explored burnt out severity in residents. Both studies measured burn out severity with the Maslach Burnout Inventory [MBI]. Elmariah et al (2017) reported higher burn out severity in residents of CBPs than UBPs [P= 0.001]. Conversely, West et al (2013) reported significantly higher depersonalization [P= 0.01] in residents trained in CBPs than UBPs. Two studies (Dupras, 2012; Yao et al., 2000) compared the prevalence of Problem Residents between UBP and CBP. Both studies reported that residents of CBPs had a higher proportion of problem residents then UBPs.

3.2.5 Communication and Interpersonal Skills- Resident-Faculty Interaction

Residents in CBPs had more supervision than UBPs, which can affect the resident pass rate for ABIM certification and display of professionalism (Atsawarungruangkit et al., 2015). Similarly, Levine et al (2005) reported residents in non-university programs were more likely to report lack of faculty mentors [61% vs. 31%; P0.001] and resident interest [55% vs. 40%; P=.01] as major barriers to resident scholarship.

3.2.6 Scholarly Activities- Resident Research

One study (Levine et al., 2005) explored residents' participation in research and scholarly activities during residency training. CBPs offered more research curriculum [P= 0.05] to residents than UBP. Residents in CBPs completed more case reports and had a higher proportion of faculty acting as mentor. Residents in UBPs had higher publication rates in peer review journals and more hypothesis based researches. No significant difference between residents in

UBPs and CBPs were found for presentations at national meetings, research funding, protected time for research and research committee member.

3.2.7 Program Organizational Factors

Chaudhry et al (2009) explored differences in program accreditation cycles between UBPs and CBPs. UBPs were associated with short accreditation cycle [P= 0.018]. Another factor that shortened the accreditation cycle was community based- teaching faculty [P= 0.003].

3.3 Barriers for Scholarly Teaching and Learning

Six studies (Berkenblit, 2012; Khandelwal, 2018; Levine, 2005; Young, 2016; Jain, 2009, West, 2013) reported barriers to the adaptation of ACGME recommendations by residency programs (Table 6). We categorized barriers into factors that were related to faculty and resident, work support [including financial and technical support], program, patient or interprofessional collaboration related. Reported barriers included fewer instruction methods [$r = -.33$, $P = .04$], lack of personal interest in counseling [[$r = -.19$, $P = .04$], and lack of clinic preceptors' interest in clinical condition [$r = -.18$, $P = .05$] (Khandelwal, 2018). Other important factors were lack of faculty time [P= 0.01], lack of faculty mentors [P= 0.001], lack of resident interests [P= 0.01], and lack of technical support [P= 0.04] (Berkenblit, 2012, Khandelwal, 2018, Levine 2005; Young, 2016). UBPs and CBP had a 62% increase in the odds of reporting residents in difficulty when compared with university-based programs [P= 0.001]; P= 0.01. Among the non-significant factors was lack of funding [P= 0.79]. Young et al (2016) reported difficulty communicating with primary care physicians as possible barriers.

Table 6. Barriers to Resident's Scholarship and Adoption to ACGME Recommendation

Category	**Factors**	**Authors**
Faculty and Resident Perceptions	Unfamiliar	Berkenblit 2012
	Concerns about confidentiality	Berkenblit 2012
	Disagree with recommendations	Berkenblit 2012
	Lack of faculty expertise	Khandelwal 2018; Levine 2005; Young 2016
	Lack of Interest	Khandelwal 2018
	perceived lack of patient interest	Khandelwal 2018
Work load related	More important teaching issues or curricular demands	Berkenblit 2012, Khandelwal 2018
	Work Load / lack of time	Berkenblit 2012, Khandelwal 2018, Levine 2005; Young 2016
Faculty and Resident related	lack of physician, faculty mentors	Khandelwal 2018; Levine 2005; Young 2016
Logistic/ Financial and Technical	Lack Support Services	Berkenblit 2012, Levine 2005
	Lack of admistrative support,	Khandelwal 2018
	inadequate financial resources,	Khandelwal 2018
Program Related	UBP vs. CBP	Jain 2009, West 2013, Levine 2005, Yao 2000
	Outpatient setting vs. Inpatient setting	Jain 2009
Patient factors	social situation or health literacy status of the patient	Young 2016
	Loss of follow up	Young 2016
Interprofessional collaboration	Difficulty communicating with primary care physicians	Young 2016

4. Discussion

In this review, we systematically explored the differences in performance and learning opportunities between residents trained in UBPs and CBPs. Measures of learning and performance were determined by residents' scholarly

activities, patient care and safety, professionalism, and intercommunication skills. Outcomes related to program and system based outcomes such as interaction with faculty mentors, clinical settings that can affect residents learning abilities and practice were also explored. Our results showed differences in learning opportunities and performance between residents of UBPs and CBPs. The number of methods used to learn about nutrition counseling for the outpatient setting, hypothesis driven research, and public training were found to be significantly higher in UBPs than CBPs. Our findings suggested that residents in UBPs vs. CBP did not differ on task oriented activities but differences in learning skills, learning opportunities were noted. We also reported important barriers that may hinder the integration and implementation of ACGME recommendations in internal medicine residency programs. Common barriers were unfamiliarity with new ACGME recommendations, lack of faculty expertise, work load, lack of technical support, lack of financial resources, and availability of faculty mentors.

Whether ACGME and RRC internal medicine recommendations reduced differences in learning opportunities and performances difference between CBP and UBP is still uncertain. Schultz et al (1994) published pre 2003 ACGME recommendations and found difference between CBP and UBP for HIV counseling practices. Jain et al (2009) published post 2003 ACGME recommendations did not report significant differences between CBP and UBP for HIV counseling. Similarly, Berkenblit et al (2012) did not report significant difference for faculty encouraging resident to offer HIV counseling, but residents at VA programs offered less HIV counseling. Two studies (Yao et al,. 2000; Dupras et al., 2012), explored difference between UBP and CBP programs and found a significantly higher prevalence of behavioral problems in resident in CBPs. Prevalence of higher burn out severity and prevalence of depersonalization and problems residents was significantly higher in internal medicine CBPS (West, 2013; Elmariah et al., 2017). Both studies were published after 2011 ACGME recommendations. Compared to residents in UBPs, residents in CBPs mostly completed case reports had lower publication rates in peer review journals. Among various medical or task related procedures, UBP performed equally to residents in CBP. Similarly, no significant difference between UBP and CBP were noted for research funding, availability of research directors, protected time for research and research committee.

4.1 Strengths and Limitations

Strength of our review is the focus on outcomes that aligned with ACGME recommendations. All included studies were multisite and cross sectional that allow for generalizability of findings. We also evaluated the quality of included studies with previously validated tools for medical education research. Our study is limited by the reporting heterogeneity of studies, which precluding a meta-analysis. Few studies reported results in an unadjusted analysis or reported their findings only descriptively due to which eliminating confounding variables were not possible.

Our review differs from previously published reviews by capturing outcomes that aligned with ACGME recommendations. Other studies (Fletcher, Davis., Underwood, Mangrulkar, McMahon et al., 2004; Fletcher, Underwood, Davis, Mangrulkar, McMahon et al., 2005; Brateanu, Yu, Kattan, Olender, & Nielsen C., 2012; Falcone, & Feinn, 2013; Rajaram, Chung, Jones, Cohen, Dahlke et al. 2014; Silber, Romano, Itani, Rosen, Small et al., 2014), only explored the effect of duty hours or explored the association of specific factors such as USMLE pass rate and score (Brown RS., 2010; Kay, Jackson, & Frank M., 2015; Yost, Gardner, Bell, Fann, Lisk, et al., 2015) in UBP and CBP residents. Previous studies were unable to associate findings with compliance overall ACGME recommendations for scholarship of learning and teaching opportunities for residents. Most reviews (Ahmed et al., 2014; Bolster L et al., 2015) explored programs progress pre and post ACGME recommendations in multiple specialties. Resource allocation and program structures can vary between residency program types of various specialties, underscoring the importance of focusing on a single specialty field. Such as, community based programs are smaller than university based program (Chen, Saidi, Rivkees, & Black, 2017), allowing residents to learn in variable clinical environments (Chen. et al., 2017; Howe A., & Ives G., 2001). Therefore we focused on performance difference and learning opportunities between UBP and CBP- internal medicine residency programs. We also identified various barriers that can affect residents training, which were in line with previous studies (Rivera, Levine, Wright, 2005). Previous studies (Kogan JR., Holmboe ES., & Hauer KE., 2009; Miller A. & Archer J., 2010) mainly focused on educational outcomes of residency training. Our review explored both educational and practice related outcomes that we know to be of practical value.

5. Conclusion

Although ACGME and RRC-IM have proposed various recommendations over the last few years, performance difference still exists between UBP and CBP internal medicine residency programs. This review indentified important performances differences between UBP and CBP residents related to patient education and counseling,

research activities and resident's behaviour. Non-significant difference was noted for procedural skills. However, our results should be interpreted in the context of included studies using unadjusted analysis and/ or reporting results only descriptively. This review provides a starting point for future studies to explore overall performance difference and effect of the ACGME recommendations between UBPs and CBPs. Future studies with large sample size and analyzing data in adjusted analysis are needed to explore above phenomena.

Competing interests/conflict of interests:

No conflict of interest

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Appendix: PRISMA flow chart