THE UNIVERSITY OF CHICAGO BIOLOGICAL SCIENCES

Understanding Associations of Maintenance of Certification (MOC) on Resource Utilization in Consultation

Shannon K. Martin MD MS SFHM
Associate Professor of Medicine
Section of Hospital Medicine, University of Chicago
ABMS Visiting Scholar 2017-2018

ABMS Conference 2019
September 23, 2019

Disclosures

- Funding sources:
  - ABMS Visiting Scholars Program Award 2017-2018
  - AAIM 2017 Innovation Grant
  - NIH Grant #4T35AG029795-10
  - National Center for Advancing Translational Sciences (NCATS) of the National institutes of Health (NIH) through Grant Number 5UL1TR002389-02 that funds the Institute for Translational Medicine (ITM)

Background

Growing body of evidence of MOC as effective intervention

- Meaningful improvement in discipline-specific practice measures
  - Improvement in process of care standards (e.g., DM care, cancer screening)[1-2]
  - Decreased costs[3]

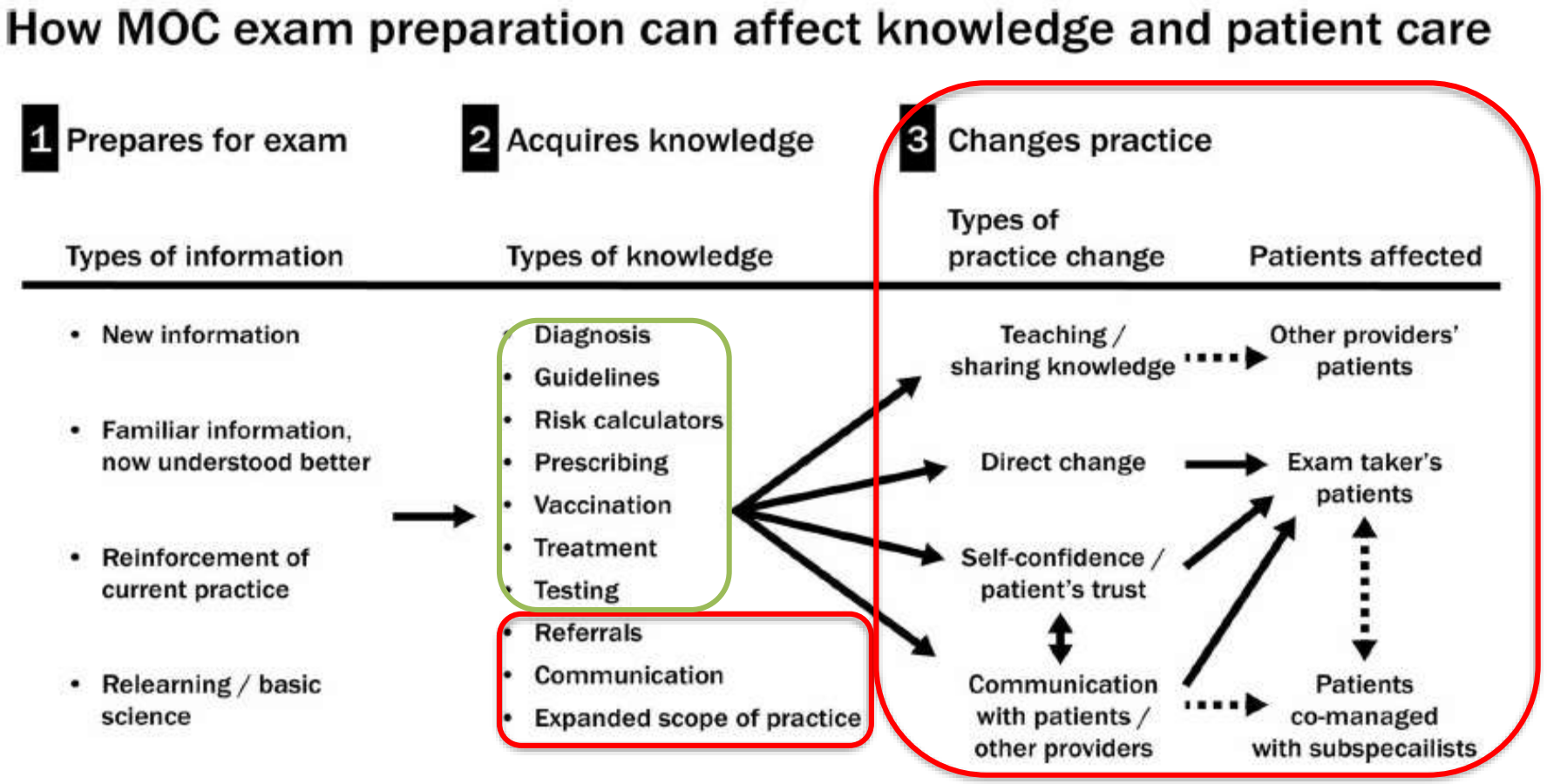
- Broader measures of physician practice and learning
  - Decreased disciplinary action[4]
  - Emerging body of literature effects on learning and mechanisms[5]

"That Was Pretty Powerful": a Qualitative Study of What Physicians Learn When Preparing for Their Maintenance-of-Certification Exams

Benjamin Chesluk, PhD[1], Bradley Gray, PhD[1], Aimee Eden, PhD[2], Elizabeth Hansen, BS[3], Lorna Lynn, MD[1], and Lars Peterson, MD[2]

J Gen Intern Med 2019 Sept; 34(9): 1790-1796

Background



Test Case: Use of Consultation

Background

How can consultation help us understand effects of MOC on physician practice?

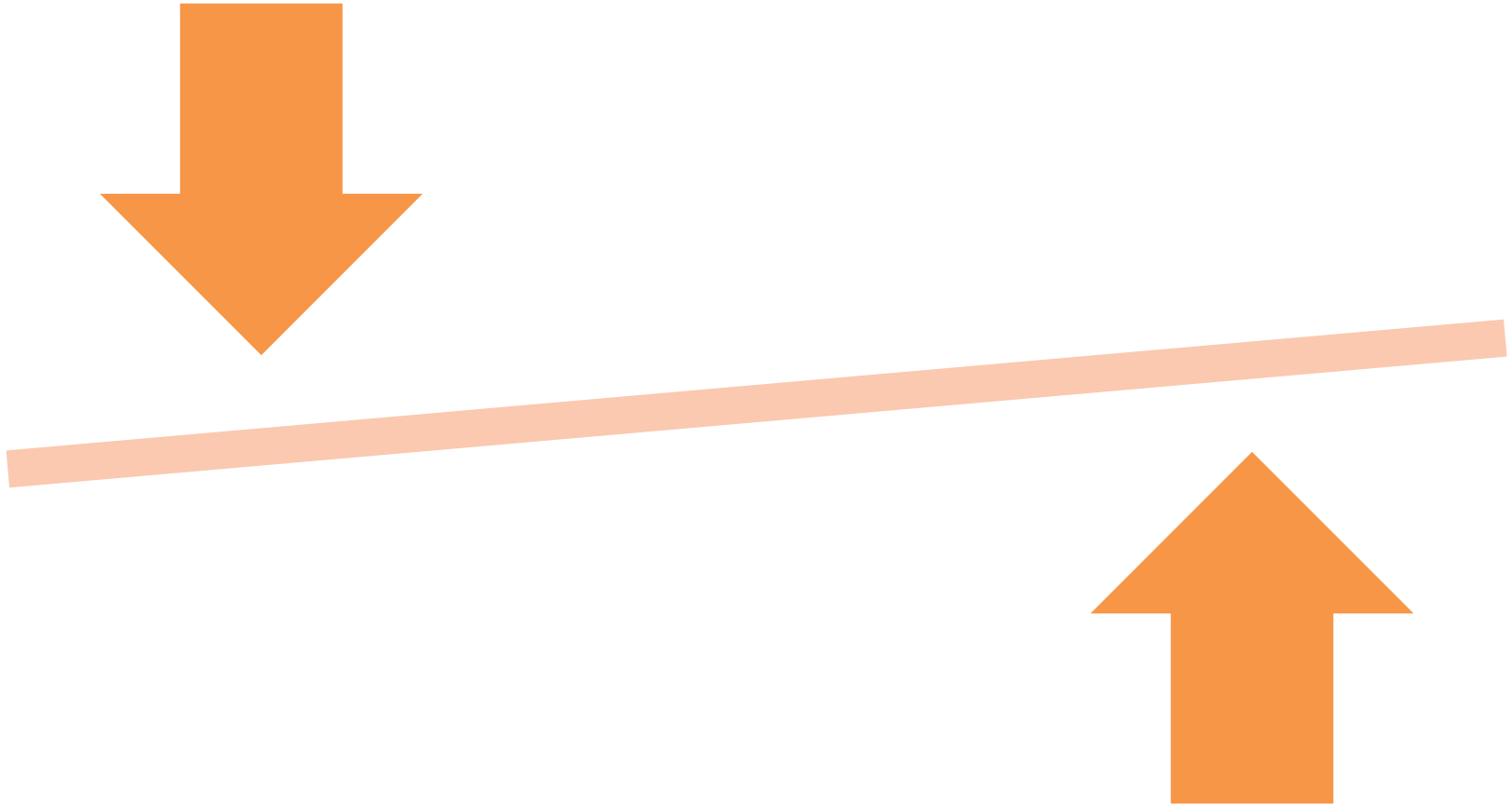
- Exceptionally commonplace in clinical practice
- Variability that is understudied and unexplained by patient condition or acuity[6-7]
  - Likely represents both underuse or overuse with potential for harm[6]

- Growing link between use of consultation and outcomes – "evidence-based consultation"
  - ID consultation in *S. aureus bacteremia* → *reduced mortality*[8]
  - Palliative consultation in advanced malignancy → *improved survival, reduced costs*[9-11]

- Implications for quality of care as well as in payment reform
  - Likely less financially viable in a global capitated payment model?
  - Utilization may be more carefully examined

Background

How does preparing for MOC affect how physicians utilize consultation?[5]

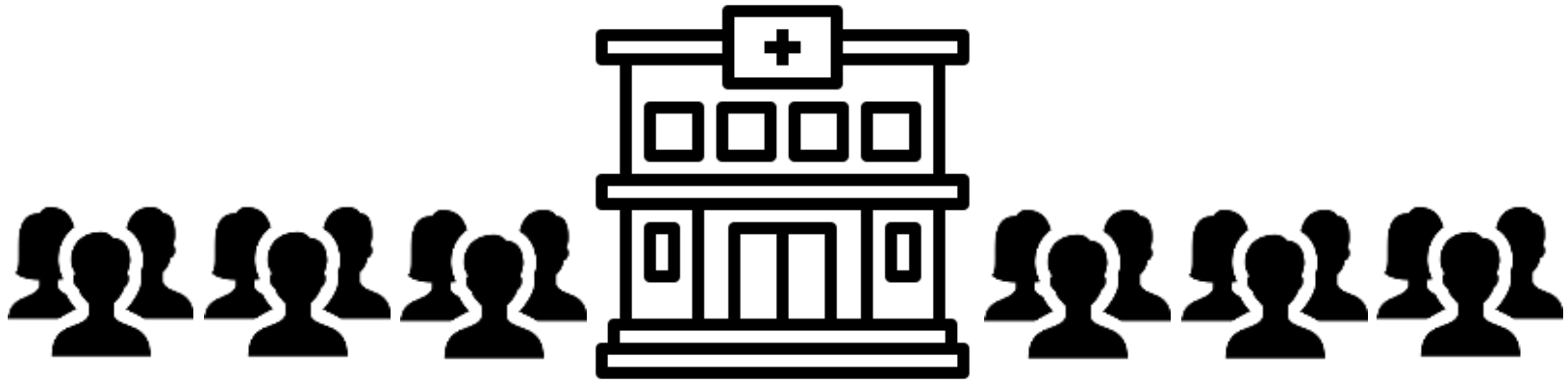


Study Aim

- To understand how undergoing MOC may be associated with practicing physicians' consultation resource utilization using an existing database of hospitalized patients on a general medicine service

The University of Chicago Hospitalist Project (HP)

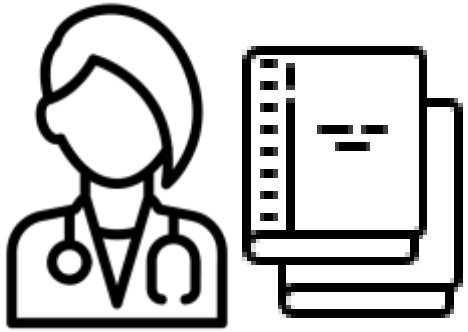
- Ongoing study established in 1997
- Evaluates care of hospitalized patients on the University of Chicago general medicine service[12-14]
- Collects patient demographic and hospitalization data from patients/proxies who consent to participation for index hospitalization and subsequent encounters



Study Design & Population

- Study design: retrospective analysis
- Study population: attending physicians eligible for board certification by the American Board of Internal Medicine (ABIM) who served on the general medicine service (GMS) caring for enrolled HP patients during study period
  - Excluded grandfathered GMS attendings
- Study period: May 10, 2011 (when complete EHR clinical documentation activated for health care system) – December 31, 2015
  - Limited by length of stay (LOS) ≤5 days to improve attribution

Study Design



Predictor Variable

GMS attending preparation for ABIM examination

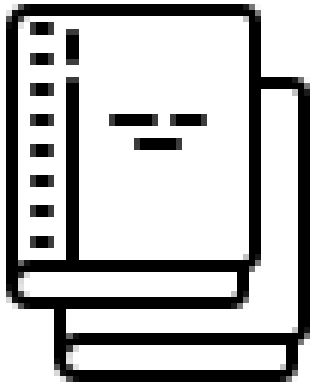
Primary Outcome Variable

Number of consultations ordered per patient per hospitalization under GMS attending

Secondary Outcome Variable

Cost

Data Abstraction – Predictor Variable



Preparation for ABIM examination

- Years since last certification event compared to year of hospitalization event
- Abstracted from ABIM website
- Example: 2 GMS attendings who attend regularly during study period

	Attending A	Attending B
Initial certification	2003	2012
Recertification	2013	n/a
Years since examination for patients hospitalized in:		
2011	8	n/a
2012	9	0
2013	0	1
2014	1	2
2015	2	3

Data Abstraction – Outcome Variables

Number of consultations per hospitalization[6-7]

- Count of unique services creating clinical documentation minus 1 for primary team
- Subtracted 2 if medical ICU included as a service to account for transfers

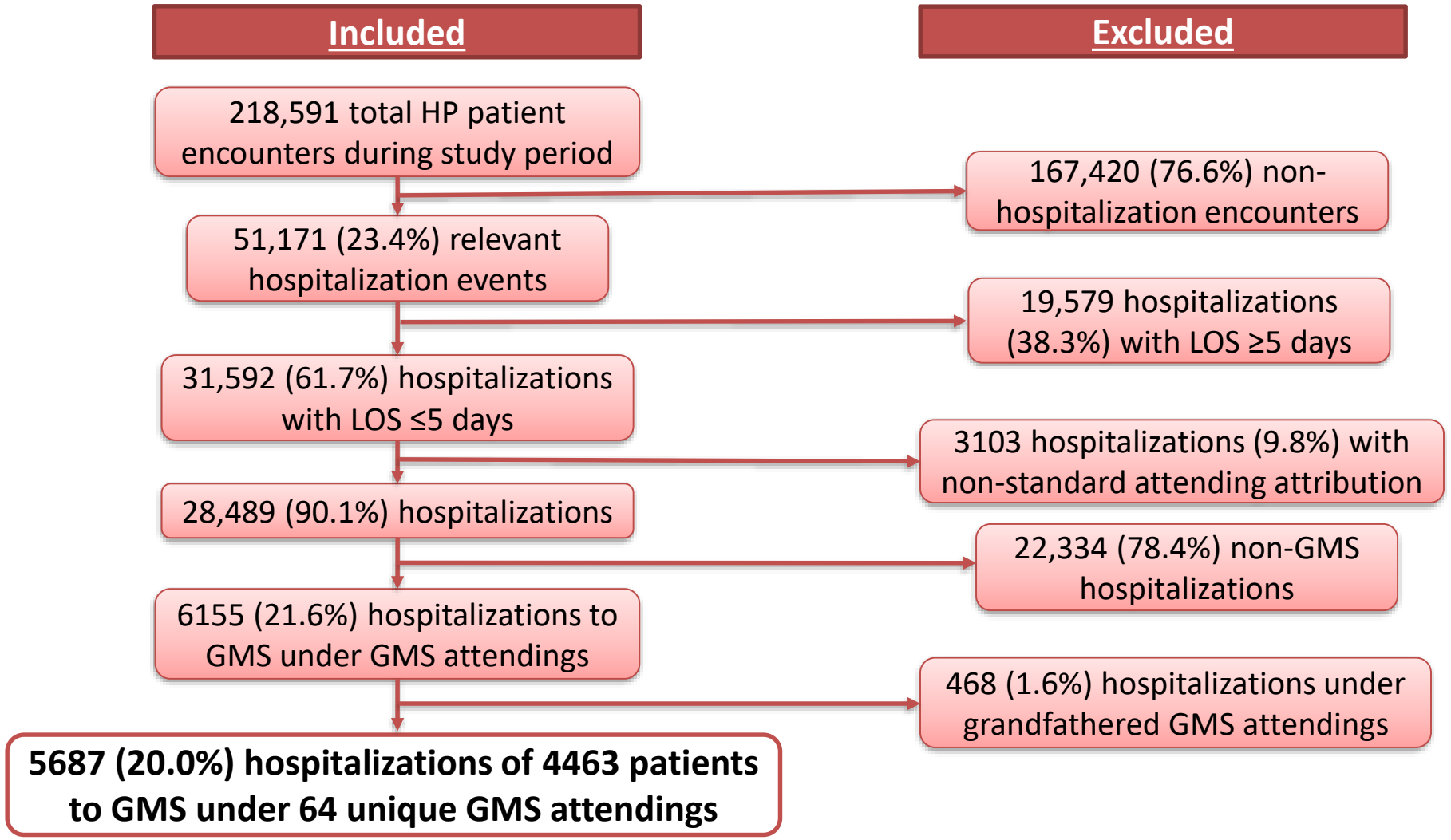
Cost

- Cost as total direct charges of hospitalizations
- Obtained via billing data

Study Analysis

- Descriptive statistics, histograms and simple tests of comparison
- Multivariate stepwise regression
  - Clustered regression models clustering on attending to control for multiple observations for each provider
    - Multilevel mixed effects Poisson regression for count of consultations
    - Multilevel mixed linear regression for charges of hospitalization with log transformation of charges

Results

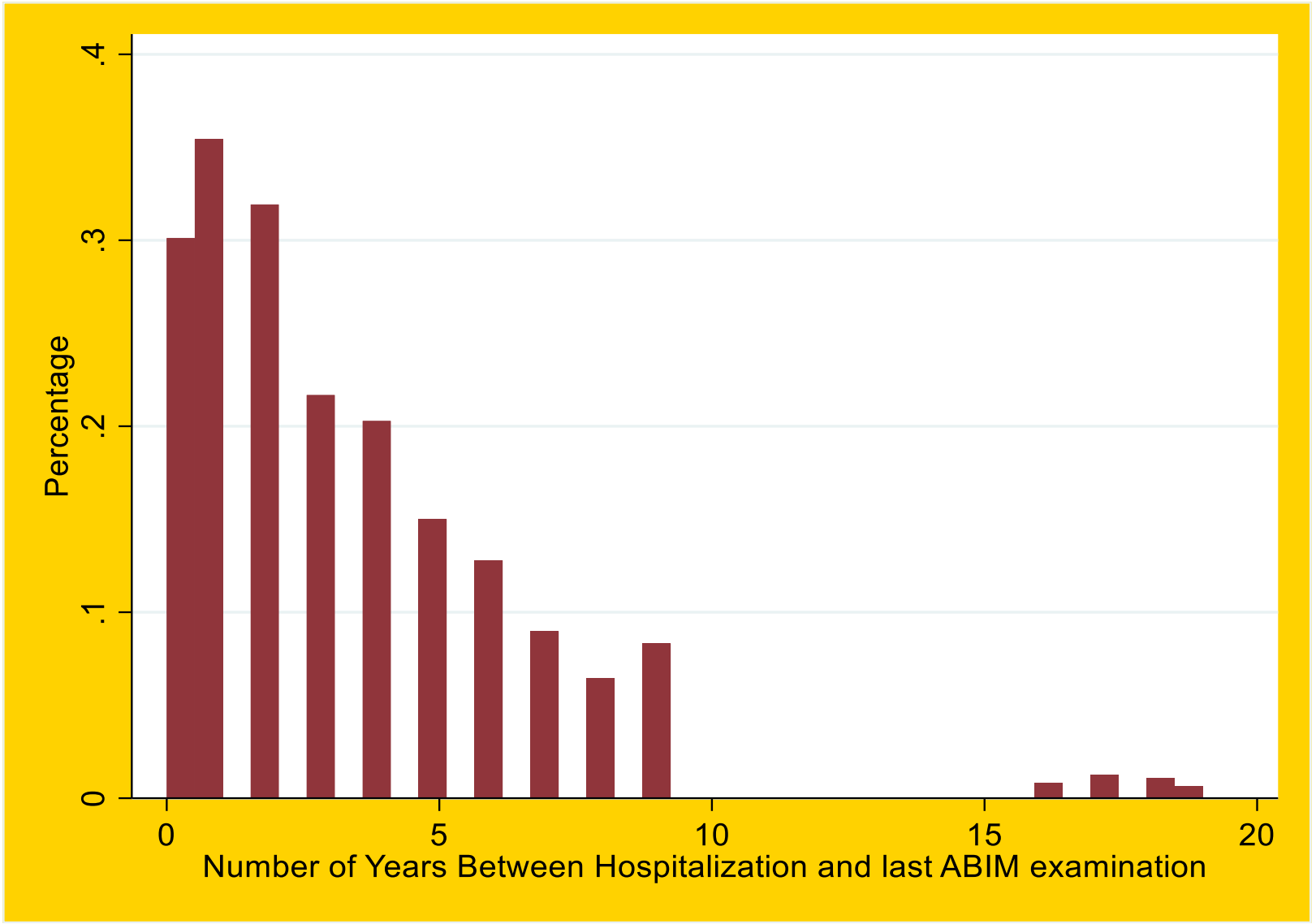

Included
Excluded
218,591 total HP patient encounters during study period
167,420 (76.6%) non-hospitalization encounters
51,171 (23.4%) relevant hospitalization events
19,579 hospitalizations (38.3%) with LOS ≥5 days
31,592 (61.7%) hospitalizations with LOS ≤5 days
3103 hospitalizations (9.8%) with non-standard attending attribution
28,489 (90.1%) hospitalizations
22,334 (78.4%) non-GMS hospitalizations
6155 (21.6%) hospitalizations to GMS under GMS attendings
468 (1.6%) hospitalizations under grandfathered GMS attendings
5687 (20.0%) hospitalizations of 4463 patients to GMS under 64 unique GMS attendings

Results

GMS Attending Demographics	N=64
Female, n(%)	31 (48.4%)
Year of graduation from medical school, n(%)	
1981-1989	2 (3%)
1990-1999	15 (23%)
2000-2009	29 (45%)
2010-present	18 (29%)
Specialty, n (%)	
Hospitalist	39 (61%)
General Internist	18 (28%)
Medical Subspecialty	7 (11%)
Certified in Internal Medicine, n(%)	61 (95%)
Had undergone recertification/maintenance of certification (MOC), n(%)	20 (31%)

Results

Year “0” – the year the attending took the examination

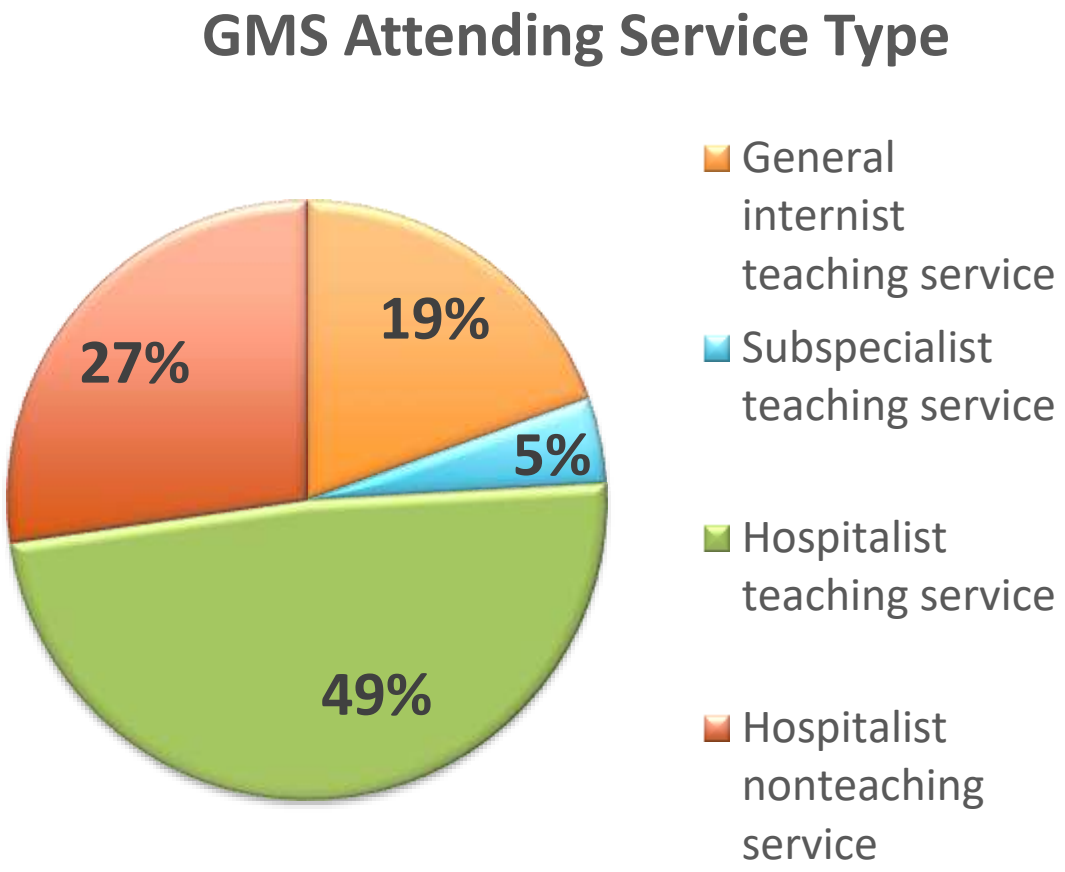


Results

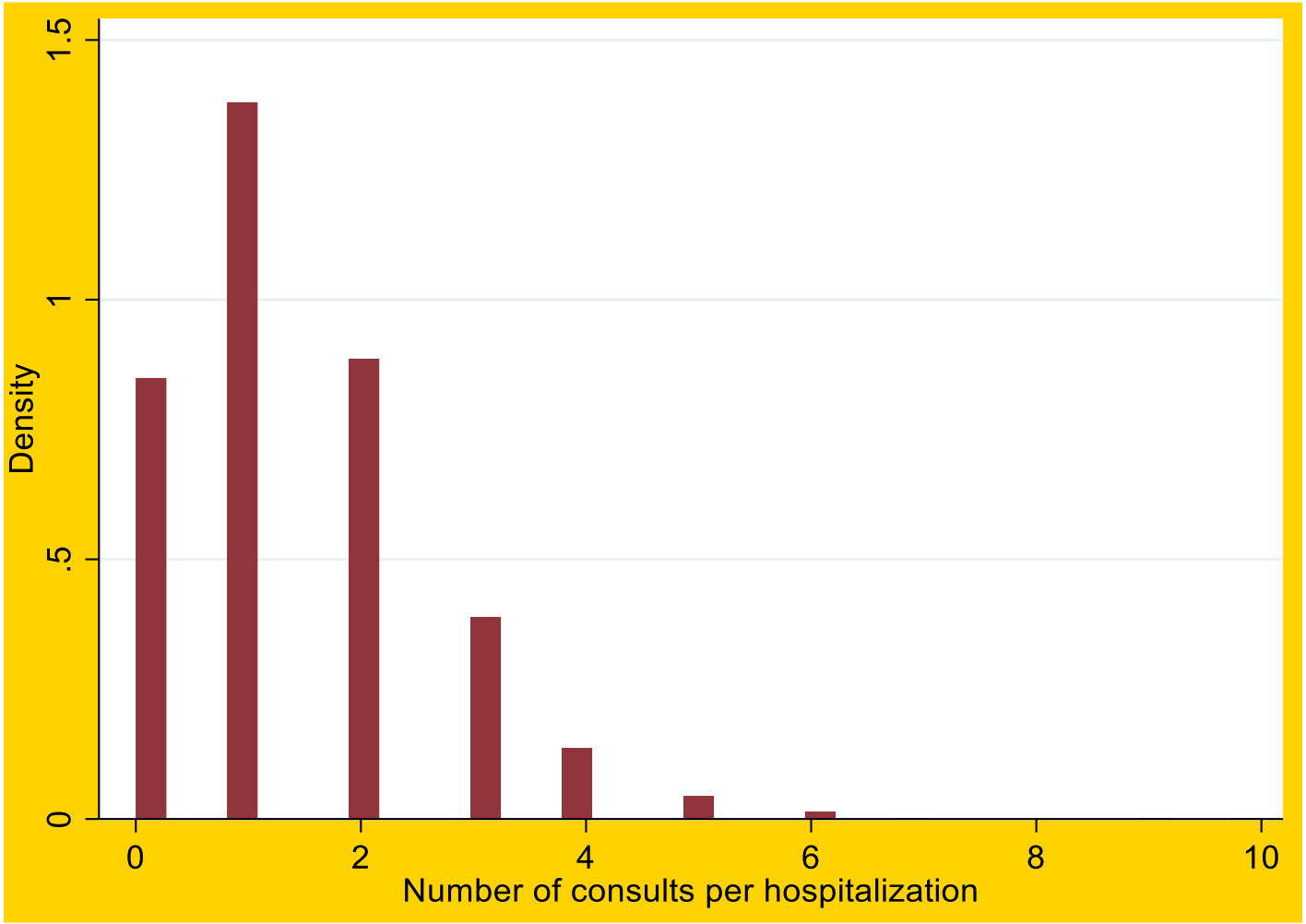
Patient Characteristics	N=4463 patients
Range of hospitalizations per patient during period	1-17
Mean (SD), median (IQR)	1.74 (1.39), 1 (1-2)
Hospitalizations per patient, n(%)	
1	3674 (65%)
2	789 (14%)
3	789 (14%)
≥4	435 (7%)
Age, mean (SD), median (IQR)	60.7 (19.4), 61 (47-75)
Payor status, n(%)	
Medicare	2772 (50%)
Medicaid	1558 (28%)
Private	1127(20%)
Self-Pay	93 (2%)
Elixhauser Indices, mean (SD), median (IQR)	
In-Hospital Mortality	5.2 (8.46), 3 (0-10)
30-Day Readmission	16.7 (15.6), 14 (2-27)

Results

Hospitalization Characteristics	N=5687
Length of Stay	
Mean (SD), median (IQR)	3.0 (1.28), 3 (2-4)
Academic tertile of admission, n(%)	
July-October	2270 (40%)
November-February	1849 (32%)
January-June	1568 (28%)



Results



Range 0-10

Mean 1.40 (1.18),
median 1 (IQR 1-2)

Results

Bivariate comparisons of outcomes of interest

	Mean consults ordered	95% CI	Std Dev	P value
Physicians who had not recertified	1.42	1.38-1.45	0.018	0.21
Physicians who had recertified	1.37	1.32-1.43	0.028	

	Hospitalization charges	95% CI	Std Dev	P value
Physicians who had not recertified	34211.88	33519.18-34904.58	21133.52	0.001
Physicians who had recertified	32162.31	31237.10-33087.53	17773.34	

Results

Multivariate model - association between years passed since ABIM examination and number of consults ordered per hospitalization for physicians who had recertified (n=1720 hospitalizations)*

Years since ABIM examination	Incidence rate ratio of change in number of consults	95% Confidence Interval	Standard Error	P value
1 year	**0.75**	**0.59-0.97**	**0.096**	**0.026**
2 years	1.18	0.98-1.41	0.109	0.079
3 years	0.91	0.70-1.19	0.124	0.504
4 years	0.98	0.79-1.20	0.103	0.818
5 years	0.88	0.74-1.05	0.079	0.157
6 years	0.89	0.75-1.05	0.078	0.170
7 years	0.92	0.76-1.11	0.088	0.363
8 years	1.05	0.88-1.27	0.099	0.572
9 years	0.94	0.78-1.12	0.852	0.477

*Multivariate mixed linear regression model clustered on attending and adjusted for possible confounding factors: attending factors – sex, specialty, years of practice; patient factors - age, sex, insurance payor, Elixhauser comorbidity indices; admission/secular factors- length of stay, year of admission, time of year

Results

Multivariate model - association between years passed since ABIM examination and log transformed hospitalization charges for physicians who had recertified (n=1388 hospitalizations)*±

Years since ABIM examination	Coefficient in log transformed hospitalization charges	95% Confidence Interval	Standard Error	P value
1 year	**-0.125**	**-0.228- -0.216**	**0.053**	**0.018**
2 years	0.012	-0.072-0.096	0.043	0.788
3 years	-0.083	-0.198-0.033	0.059	0.161
4 years	0.050	-0.068-0.169	0.060	0.405
5 years	-0.054	-0.143-0.034	0.045	0.228
6 years	-0.067	-0.153-0.197	0.044	0.130
7 years	**-0.153**	**-0.250- -0.055**	**0.050**	**0.002**
8 years	-0.043	-0.128-0.042	0.043	0.324
9 years	**-0.095**	**-0.178- -0.012**	**0.042**	**0.025**

*Multivariate mixed linear regression model clustered on attending physician and adjusted for possible confounding factors: attending factors – sex, specialty, years of practice; patient factors - age, sex, insurance payor, Elixhauser comorbidity indices; admission/secular factors- length of stay, year of admission, time of year

±Missing data

Results

Multivariate model - association between years passed since ABIM examination and number of consults ordered per hospitalization for physicians undertaking initial certification(n=3753 hospitalizations)*

Years since ABIM examination	Incidence rate ratio of change in number of consults	95% Confidence Interval	Standard Error	P value
1 year	0.93	0.85-1.02	0.044	0.144
2 years	0.98	0.90-1.09	0.050	0.728
3 years	0.97	0.86-1.09	0.057	0.579
4 years	**0.86**	**0.76-0.97**	**0.051**	**0.011**
5 years	**0.84**	**0.71-0.99**	**0.071**	**0.038**
6 years	0.94	0.77-1.13	0.092	0.480
7 years	0.77	0.52-1.12	0.149	0.171
8 years	No observations	-	-	-
9 years	0.86	0.48-1.55	0.257	0.623

*Multivariate Poisson regression model clustered on attending physician and adjusted for possible confounding factors: attending factors – sex, specialty, years of practice; patient factors - age, sex, insurance payor, Elixhauser comorbidity indices; admission/secular factors- length of stay, year of admission, time of year

Results

Multivariate model - association between years passed since ABIM examination and log transformed hospitalization charges for physicians undertaking initial certification (n=3419 hospitalizations)*±

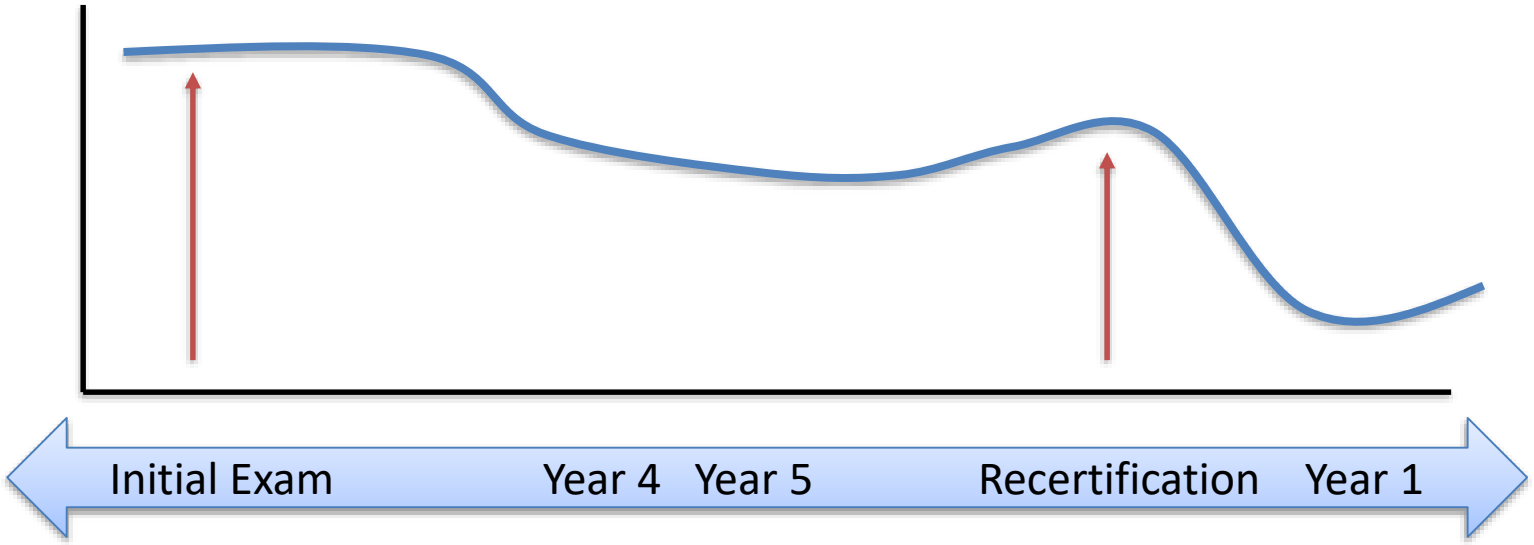
Years since ABIM examination	Coefficient in log transformed hospitalization charges	95% Confidence Interval	Standard Error	P value
1 year	0.012	-0.036-0.059	0.024	0.630
2 years	-0.023	-0.073-0.028	0.026	0.382
3 years	-0.029	-0.083-0.026	0.028	0.304
4 years	0.003	-0.054-0.060	0.029	0.927
5 years	-0.041	-0.116-0.034	0.038	0.283
6 years	-0.051	-0.139-0.038	0.045	0.263
7 years	0.128	-0.032-0.288	0.082	0.117
8 years	No observations	-	-	-
9 years	**-0.332**	**-0.619- -0.044**	**0.147**	**0.024**

*Multivariate mixed linear regression model clustered on attending physician and adjusted for possible confounding factors: attending factors – sex, specialty, years of practice; patient factors - age, sex, insurance payor, Elixhauser comorbidity indices; admission/secular factors- length of stay, year of admission, time of year

±Missing data

Discussion

- Demonstrates selected effects of time since MOC on the use consultation on inpatient general medicine services
- Time effects depend on if recertifying while participating in MOC or a first time exam-taker
  - Year 1 effect for recertifiers – 25% reduction in consultations
  - Year 4 & 5 effect for first-time exam takers – ~15-17% reduction in consultations



Discussion

- Year 1 effect may strengthen arguments for longitudinal assessment in continuing certification[15-16]
  - Prior effects report on knowledge-based examinations[17-18]
  - Provides important link to change in clinical practice
  - Reduction in hospitalization charges in first year – link to patient outcomes?

Limitations

- Retrospective analysis, unmeasured confounders
- Data from general medicine inpatient setting from one large urban academic quaternary care center and may lack generalizability
- Systematic attending attribution but potential attribution error in attending assignation
- Sample limited by LOS in study design
- Total hospitalization charges ≠ costs; consultation charge data incomplete due to changes in professional billing system during study period
- Consultation measured only as a count, unable to determine benefits or risk of more or less consultation and patient outcomes

Conclusions

- There may be associations between time from physician participation in MOC and use of consultation on inpatient general medicine services
- Strengthens evidence from prior qualitative work demonstrating how physicians learn and change practice while preparing for MOC
- Effects on change in practice may be most prominent in **first year following recertification**

Particularly important to further understand in setting of move toward longitudinal assessment

- Further work necessary to understand meaning of changes in consultation utilization, link to patient outcomes, and delineation of cost findings

Acknowledgements

- ABMS Visiting Scholars Program
- David Price, Tom Graniter, Suzanne Resnick, Betheon Whyte
- UChicago research team: Marika Kachman BA, Keme Carter MD, Andrea Flores MA, John Cursio PhD, David O. Meltzer MD PhD, Vineet M. Arora MD MAPP
- 2017-2018 ABMS Visiting Scholars Cohort:
  - Regan Bergmark MD
  - Johnathan Bernard MD MPH
  - Martin Casey MD MPH
  - Souvik Chatterjee MD
  - Brian Garibaldi MD

References

1. Gray BM, Vandergrift JL, Lipner RS. Association between the American Board of Internal Medicine's General Internist's Maintenance of Certification Requirement and Mammography Screening for Medicare Beneficiaries. *Womens Health Issues.* 2018;28(1):35-41.
2. Gray B, Vandergrift J, Landon B, Reschovsky J, Lipner R. Associations Between American Board of Internal Medicine Maintenance of Certification Status and Performance on a Set of Healthcare Effectiveness Data and Information Set (HEDIS) Process Measures. *Ann Intern Med.* 2018;169(2):97-105.
3. Gray BM, Vandergrift JL, Johnston MM, et al. Association between imposition of a Maintenance of Certification requirement and ambulatory care-sensitive hospitalizations and health care costs. *Jama.* 2014;312(22):2348-2357.
4. McDonald FS, Duhigg LM, Arnold GK, Hafer RM, Lipner RS. The American Board of Internal Medicine Maintenance of Certification Examination and State Medical Board Disciplinary Actions: a Population Cohort Study. *Journal of General Internal Medicine.* 2018;33(8):1292-1298.
5. Cheshluk B, Gray B, Eden A, Hansen E, Lynn L, Peterson L. "That was pretty powerful": A qualitative study of what physicians learn when preparing for their maintenance-of-certification exam. J Gen Intern Med. 2019 Sep;34
6. Stevens JP, Nyweide D, Maresh S, et al. Variation in Inpatient Consultation Among Older Adults in the United States. *J Gen Intern Med.* 2015;30(7):992-999.
7. Kachman M, Carter K, Arora V, Meltzer D, Flores A, Martin S. Describing variability of inpatient consultation practices on general medicine services: patient, admission, and physician-level factors. Abstract presented at: Hospital Medicine 2018: April 8-11; Orlando, Fla. Abstract 352. https://www.shmabstracts.com/abstract/describing-variability-of-inpatient-consultation-practices-on-general-medicine-services-patient-admission-and-physician-level-factors/. Accessed September 13, 2019
8. Lahey T, Shah R, Gittzus J, Schwartzman J, Kirkland K. Infectious diseases consultation lowers mortality from Staphylococcus aureus bacteremia. *Medicine (Baltimore).* 2009;88(5):263-267.
9. Temel JS, Greer JA, Muzikansky A, Gallagher ER, Admane S, Jackson VA, Dahlin CM, Blinderman CD, Jacobsen J, Pirl WF, Billings JA, Lynch TJ. Early palliative care for patients with metastatic non-small-cell lung cancer. N Engl J Med. 2010 Aug 19;363(8):733-42.
10. Glasgow JM, Zhang Z, O'Donnell LD, Guerry RT, Maheshwari V. Hospital palliative care consult improves value-based purchasing outcomes in a propensity score-matched cohort. *Palliat Med.* 2019:269216318824270.
11. Morrison RS, Dietrich J, Ladwig S, et al. Palliative Care Consultation Teams Cut Hospital Costs For Medicaid Beneficiaries. *https://doiorg/101377/hlthaff20100929.* 2017;30(3):454-463.
12. Meltzer D, Manning WG, Morrison J, et al. Effects of Physician Experience on Costs and Outcomes on an Academic General Medicine Service: Results of a Trial of Hospitalists. *Annals of Internal Medicine.* 2002;137(11):866-874.
13. Martin SK, Farnan JM, Mayo A, Vekhter B, Meltzer DO, Arora VM. How do attendings perceive housestaff autonomy? Attending experience, hospitalists, and trends over time. *Journal of Hospital Medicine.* 2013;8(6):292-297.
14. Martin SK, Farnan JM, Flores A, Kurina LM, Meltzer DO, Arora VM. Exploring Entrustment: Housestaff Autonomy and Patient Readmission - ScienceDirect. *American Journal of Medicine.* 2014;127(8):791-797.
15. ABIM, "ABIM to Develop Longitudinal Assessment Option", ABIM Blog. August 20, 2019, http://blog.abim.org/abim-to-develop-longitudinal-assessment-option/. Accessed September 13, 2019.
16. American Board of Medical Specialties, "Longitudinal Assessment Balances Learning and Assessment," ABMS Insights, June 13, 2019. https://www.abms.org/news-events/longitudinal-assessment-balances-learning-and-assessment/. Accessed September 13, 2019.
17. Larsen DP, Butler AC, Roediger HL 3rd. Comparative effects of test-enhanced learning and self-explanation on long-term retention. Med Educ 2013 Jul; 47(7):674-82.
18. Shaw TJ, Pernanr LI, Peyre SE et al. Impact of online education on intern behaviour around joint commission national patient safety goals: a randomised trial. BMJ Quality & Safety 2012;21:819-825.