Title: Physician Cognition, Inpatient Advance Care Planning, and Outcomes for Seriously Ill Older Adults

Investigators: Amber E. Barnato MD, MPH, MS and Jonathan Skinner PhD

Executive Summary

This is a request for supplemental funding to subproject #5 of Jonathan Skinner's P01 "Causes and Consequences of Healthcare Efficiency" entitled "Physician Cognition, Inpatient Advance Care Planning, and Outcomes for Seriously Ill Older Adults." Specifically, the project has funding for an efficacy study of a novel behavioral intervention (Specific Aim #3). We are seeking funding to embed two effectiveness arms into the trial.



The novel behavioral intervention is a theoretically-based adventure video game (Hopewell Hospitalist) designed to shift hospitalists' decisional threshold for having advance care planning (ACP) conversations with hospitalized adults age 65 and older. We developed the game in late 2019 (see iTunes app store). The game is modified from one we previously developed and tested for a different clinical context, trauma triage (see publications in BMJ and PNAS).

The intervention builds upon our prior research involving participant observation, simulation, and cognitive interviews which suggest physician judgment regarding whether or not a patient is near the "end of life" (EOL) drives ACP conversations. We hypothesize that this judgment is not simply a product of explicit, knowledge-based prognostication, but is influenced by physicians' heuristics (implicit, unconscious cognition related to pattern recognition). Hopewell Hospitalist is therefore designed to influence these heuristics via narrative engagement.

We have funding to conduct a pragmatic efficacy trial of the game in partnership with a national physician management group that employs ~2,000 hospital-based physicians (hospitalists) at ~ 200 community hospitals across the U.S. To increase the impact of our study, this NBER supplement will provide resources to test two additional primary hypotheses by adding two effectiveness arms to the trial (see Figure in the draft study protocol, next page). This would increase enrollment from 20 → 200 hospitals, corresponding to 200 → 2000 physicians and 32,000 → 320,000 evaluable patients. We have developed a data safety and monitoring plan and empaneled the data safety and monitoring board. We are in the process of finalizing our clinicaltrials.gov registration. We can delay effectiveness enrollment until June 2020, if necessary.

Budget Requirements

Expenditure category		Total
Personnel		
Barnato, Amber (PI, contributed)	-	
Chelen, Julia (post-doc)	20% x 9 mo	
Murphy, Margaret (programmer)	20% x 9 mo	
Salary + fringe (35%)	$22,242 + $7,785 fringe	$30,026
Supplies		
Refurbished iPads ($200 x 90)	$18,000	
Materials and mailers for iPads ($50 x 90)	$4,500	$22,500
Total direct		$52,526
Indirect (64%)		$33,617
Total budget requested		**$86,143**

DRAFT Study Protocol: Hopewell Hospitalist
Hybrid efficacy – effectiveness clinical trial

Objective: to test the effect of hospitalist access* to a theoretically-based, customized video game on their rates of ACP discussions with hospitalized older adults.

*Access includes three experimental conditions that vary in their likelihood of game use (and, therefore, exposure):

a. Providing the hospitalist an iPad pre-loaded with the game [efficacy]
    i. Intention to treat: all providers given an iPad
    ii. Per-protocol: all providers who played for at least 2 hours
b. Sound hospital colleague provides instructions for downloading and using the game [effectiveness, peer-delivered]
c. Physicians supervisor provides instructions for downloading and using the game [effectiveness, organization-delivered]

Trial design: Hybrid efficacy-effectiveness study (see Figure)

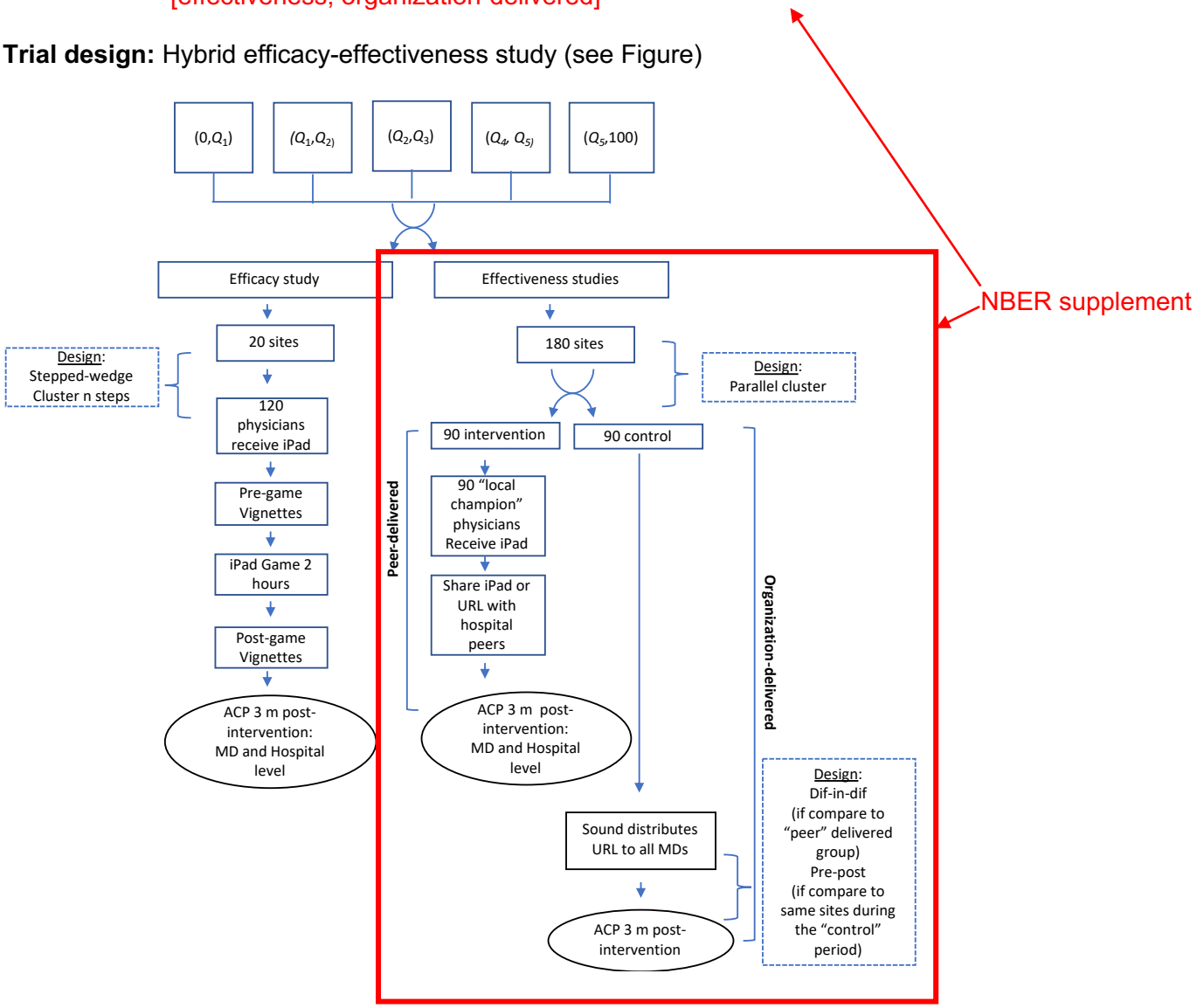


Figure. Hybrid efficacy-effectiveness trial involving sequential roll-out of Hopewell Hospitalist to all Sound Physicians through three mechanisms, hypothesized to be decreasing in their effect size on the primary outcome of ACP in the 3 months post-intervention: (1) all MDs in a hospital receive a pre-loaded iPad (efficacy); (2) a "local champion" receives the iPad, then distributes the game URL (or shares iPad) with hospital colleagues and encourages use (effectiveness: peer-delivered); (3) and Sound leadership distributes the game URL and encourages use (effectiveness: organization-delivered)

Rationale for randomizing at the hospital level. All three study arms randomize at the hospital level. Hospitalists work in teams and share patients across shifts during the same week (day hospitalists, nocturnists) and across weeks (for patients whose hospital stay bridges two or more hospitalists' weeks on service). They observe one another's work and are affected by one another's decisions. We hypothesize that intervention impact at the individual provider level will be greater if all hospitalists in a group are exposed through positive peer effects and decreased inhibition. Further, treatment assignment at the hospital level decreases threats to internal validity (e.g., misclassification, contamination).

If individual physicians are randomized, there is increased risk of:

a. misclassification of the outcome-exposure relationship because of the fact that ~20% of patients (likely those with the highest mortality risk) will encounter more than one physician during their hospitalization (bias to null);
b. contamination because physicians may discuss the intervention with their colleagues (bias to null); and
c. system-level barriers to the completion of ACP billing that can only be overcome by physicians working as a group (bias to null).

TIMELINE

		1/20	2/20	2/20	3/20	4/20	5/20	6/20	7/20	8/20	8/20	8/20
efficacy	10 sites	UC	UC	UC	HH	HH	HH	HH	HH	HH	HH	HH
	10 sites	UC	UC	UC	UC	HH	HH	HH	HH	HH	HH	HH
effectiveness	90 sites	UC	UC	UC	HH	HH	HH	HH	HH	HH	HH	HH
	90 sites	UC	UC	UC	UC	UC	UC	UC	HH	HH	HH	HH
	Excluded sites*	UC	UC	UC	UC	UC	UC	UC	HH	HH	HH	HH

UC – Usual Care
HH – Hopewell Hospitalist – red box includes the delivery month of the intervention and the 3-months post intervention deployment
*excluded sites will include those with only 1 MD

EFFICACY
This pragmatic efficacy trial is funded by the P01. We will use a hospital-level stepped wedge cluster design. The intervention will be provided to all (willing) physicians in a hospital. The primary outcome is ACP billing in the quarter after iPad delivery + 2 weeks (for game play).

Table 1. Illustration of the stepped wedge, one-way crossover design

		Stepped Wedge Deployment Schedule (with 2 steps)						
	1/20	2/20	2/20	3/20	4/20	5/20	6/20	7/20
Hospitals randomized to step 1	UC	UC	UC	HH	HH	HH	HH	HH
Hospitals randomized to step 2	UC	UC	UC	UC	HH	HH	HH	HH

UC – Usual Care
HH – Hopewell Hospitalist (intervention deployment)

Rationale for stepped wedge rather than parallel cluster randomized design. Given that the ICC at the hospital level (0.079) is greater than at the physician (0.044) level, there is a high risk for imbalance in a parallel cluster randomized trial. The stepped wedge allows for each hospital to serve as its "own control" (e.g., contribute pre- and post-intervention period data). The randomization to order of intervention receipt is a relatively weak randomization scheme, however, and strength of causal inference will be somewhat closer to a quasi-experimental difference-in-difference observational study than a clinical trial. Nevertheless, a stepped-wedge design will have more power than a parallel cluster trial of the same size.

Eligibility of subjects: All inpatient hospitalist physicians who have worked for Sound Physicians at a study hospital for at least one quarter are eligible to participate.

Study settings: Hospitals staffed by Sound Physicians: There are ~200 hospitals across the US with a total of ~2000 eligible hospitalists.

Sampling: Stratified random sampling hospitals. We seek balance in the following characteristics:

- risk-adjusted ACP billing rate
- Number of hospitalists (note: need to avoid sampling sites for the efficacy study with so many hospitalists that we exceed our budget for iPad distribution)
- Academic medical center

Specific eligibility requirements for efficacy study

- availability of Clinical Performance Nurse to pull charts

Key uncertainty, information needed, or action required	**Responsible person(s)**
Sampling strategy for hospitals	Barnato, Mohan, O'Malley
Design review	DSMB

Intervention conditions:

- Usual care:
  - Sound's Patient Experience Project: a CME accredited e-learning curriculum including 5 modules that take approximately 3 hours to complete. Typically required by Sound by an employee's two year anniversary. The format includes Power Point slides with objectives, video to highlight what to expect and key

lessons, and video of mock interactions/ role playing with patients (actors) with a expert highlighting techniques that do not work as well as those that do. There is also a quiz at the end of each module highlighting key concepts and a list of references.
    - Financial incentive to individual hospitalists ($20 per correctly documented and billed ACP visit).
    - Audit and feedback to the hospitalist chiefs (may or may not be shared with individual hospitalists).
- Video Game Intervention:
    - *Hopewell Hospitalist* is an adventure video game that attempts to lower physicians' decisional threshold for having an ACP conversation through narrative engagement (persuasion through storytelling).

Intervention delivery: We will provide physicians with the game pre-loaded on an iPad, and ask them to use the game for >2 hours over the course of 2 weeks.

Key uncertainty, information needed, or action required	***Responsible person(s)***
Vendor for refurbished iPads (!) Efficacy: n=120 Effectiveness: n=90	Stroffolino, Chelen N linked to sample size check (O'Malley)
Materials development (recruitment materials, iPad holders, mailers)	Mohan, Chelen (students)
iPad App installation	Chelen (students)
DCF linking physician participants to HH usernames and passwords	Chelen (students), Rudolph, Murphy

Measured variables/outcomes:

A. Predictors:
    1. Demographics/personal characteristics: participant age, race/ethnicity, board certification, location of medical school, location of residency/fellowship, years in practice, number of patients evaluated/week of service, number of weeks on service/year. ACP rate of physician at baseline.
    2. Physician exposure to hospital-level ACP interventions not related to this trial (Sound PEP educational modules)
    3. Use of intervention: self-reported time spent; data pulled from MyAnalytics: time spent, number of encounters, cases completed, decisions made, feedback seen.
    4. Physician decision making competency:
        - Subjective numeracy (3 items).
    5. Mediator of intervention:
        - Post-test score on Sound PEP modules
        - Engagement: Narrative Engagement Questionnaire (see Appendix)
        - Positive and negative affect schedule (see Appendix)
        - Usability/tolerability (see Appendix)

B. Clinical Outcomes
    1. Primary outcome: ACP billing in the quarter after intervention.
    2. Secondary outcomes [lagged availability of data]:
        a. Rate of ACP billing at study hospitals in the 1-year following the trial.
        b. Physician reported ACP conversations in MIPS (from Sound).

c. Mortality. In-hospital mortality, 90-day mortality for patients treated at the hospitals during the study.
d. Resource utilization during the index hospitalization. Length of stay, admission to ICU, mechanical ventilation, disposition status, tracheostomy, G-tube placement, new onset dialysis (assuming reliable way to capture), palliative care consults (assuming reliable way to capture).
e. Resource utilization during the 1-year after the index hospitalization. Number of admissions to the hospital; use of post-acute care; use of hospice.

C. Intermediate outcomes:
1. MiPS advance care planning (physician self-report)
2. Validation of ACP billing as an outcome: chart review.

Key uncertainty, information needed, or action required	**Responsible person(s)**
Feasibility of conducting a chart review	Murphy, Rudolph

Sample size: We will recruit physicians at 20 hospitals and will expose them sequentially to the video game intervention. Assumptions include: the baseline ACP rate (rising by 1.25%/quarter), relatively high ICC at the hospital level (ICC~0.008-0.115), mean of 10 physicians/hospital, 160 patients/MD/quarter. We anticipate that with 20 hospitals, sequentially randomized in two steps, and with 60% of physicians at each hospital participating, that an absolute difference of 3% in ACP billing rates can be detected with 80% power.

Key uncertainty, information needed, or action required	**Responsible person(s)**
Check sample size calculation (!)	Barnato, Mohan, O'Malley

Interim analyses and stopping guidelines: None

Randomization: All sites will have 3 months of usual care data. Hospitals will be randomized to the order in which they receive the iPads loaded with intervention and outcome assessment materials.

Study protocol: When the site goes live, we will send iPads to the Clinical Performance Nurse, so that s/he can distribute the devices to the hospitalist on staff. We will then contact each participant with information about the trial and the study tasks. We cannot blind study personnel and participants to the intervention after deployment. However, we will mask group assignment during the analysis phase. We will ask participants to use their intervention within two weeks of receipt for at least 2 hours. Participants will log into a website after using the intervention to report their demographics/personal characteristics, experience using the intervention (including engagement), and any qualitative usability/tolerability feedback. This would also be the time that they complete the case vignettes (if applicable). We anticipate that completing the questionnaires and the case vignettes will take about 1 hour. Participants will keep the iPad as an honorarium (approximate value: $200).

Statistical methods/Analysis plan

Primary outcome: ACP billing

Table 3. Hypothetical Data Structure

Hospital ID	Epoch	Physician ID	Physician exposure	Patient ID	Hospital Day	Physician ID	Billed ACP	Epoch
A	UC	1	0	1	1	1	1	UC
A	UC	1	0	1	2	1	0	UC
A	UC	1	0	1	3	1	0	UC
A	UC	1	0	2	1	1	0	UC
A	UC	2	0	2	2	2	1	UC
A	UC	2	0	3	1	2	0	UC
B	HH	4	1	4	1	4	0	HH
B	HH	4	1	4	2	4	0	HH
B	HH	5*	0	4	3	5	1	HH
B	HH	4	1	5	1	4	0	HH
B	HH	4	1	5	2	4	1	HH
B	HH	5*	0	6	1	5	1	HH

*Assuming physician 5 does not agree to participate and/or does not use the game

H_a1: Hospital ACP billing rates in the post-intervention quarter will increase by at least 3 percentage points more than would be expected by secular trends alone.
*We will power to test this hypothesis.

Intermediate outcome (subsample): Chart review
H_a2: Physician ACP MiPS scores at hospitals involved in the efficacy study will increase in the post-intervention quarter more than at control hospitals.
H_a3: Billing rates for ACP conversations (at the hospital level) will be positively correlated with documentation of ACP conversations in patient charts.

Effect modification/mediation:
H_a4: The magnitude of the increase in the ACP billing rate at the hospital level will be associated with the fraction of the physicians who completed the intervention.
H_a5: The magnitude of the increase in the ACP billing rate at the hospital level will be associated with physicians' self-reported engagement with the intervention.
H_a6: The magnitude of the increase in the ACP billing rate will be greater among those with higher Sound PEP module post test scores (~53% MDs have completed).

Primary Outcome Primary Analysis plan:

The statistical model for the primary analysis in the efficacy study emulates a cluster-level stepped-wedge design in that each hospital begins in the control setting and at some-point transitions to the treated (post Game roll-out) setting. This analysis addressed H1. For patient *i* seen by physician *j* at hospital *h* in time-period *t* let Y_{ijt} be a binary random variable indicator whether has an billed ACP conversation; $Post_{jt}$ be a time-varying hospital indicator of whether the game has been rolled-out ($Post_{jt} = 1$) or has yet to be rolled-out ($Post_{jt} = 0$); x_{ijt} be a vector of patient-level controls; θ_{jh} a random effect for physician within hospital and hospital and λ_h a random-effect for hospital. Including time-period as a categorical predictor the model is given by:

$$logit(\Pr(Y_{ijht} = 1|\theta_{jh}, \lambda_h)) = \beta_0 + \beta_1 Post_{ht} + \beta_2 x_{ijht} + \beta_{3t} + \theta_{jh} + \lambda_h$$

The key coefficient is β_1, which captures the structural shift in the outcome that occurs when a patient attends a hospital after the roll-out of the game versus prior to this time. Because $Post_{ht}$ does not vary within a time-period, the information in the observations made within a hospital and time-period depends on the size of the effects of hospital and time-period with the statistical significance of inferences about β_1 likely to be reduced by the clustering of observations in physicians. The specification of this model in Stata is:

melogit billed_acp patient_covariates epoch || hosp: || md:, or

A complication that is glossed over with the above analysis plan is that a patient may encounter multiple (Sound) physicians during their hospital stay. Because most patients (approximately 80%) are expected to encounter a single physician, the model is presented as if all patients were attended to by a single physician. To handle more complex patient stays we will explore several strategies using a plurality rule to assign patients to the physician they see the most or who appears to be overseeing the patients stay. In a more advanced analysis, we will consider using a multiple membership model to account for the proportional influence of each physician visited.

Primary Outcome Secondary Analysis plan:

The primary outcome secondary analysis differs from the above model by conditioning on the extent to which the Sound physicians participated in the game. This analysis addresses H3. Let $Game_{jht}$ denote a measure of the extent to which the physicians that patient *i* encountered had played the game by time-period t and $Game_{ht}$ denote a measure of the extent to which all of the physicians at hospital *h* have played the game by time-period t. Several specifications for the statistical model will be considered. The simplest uses $Game_{jht}$ as a predictor and sets $Game_{jht} = 1$ if any physicians of patient i have played the game by time-period *t* and $Game_{jht} = 0$ otherwise. We label this as scenario (i). Under scenario (i) if $Post_{jt} = 0$ then $Game_{jht} = 0$ for all *j* in time-period *t*. However, if $Post_{jt} = 0$ then it can be the case that $Game_{jht} = 0$ (this occurs when the game has been rolled-out at the hospital but physician *j* hasn't played it yet). Scenario (ii) sets $Game_{jht}$ to be the proportion of the physicians a patient actually saw who have played the game. Scenarios (iii) and (iv) are as for (i) and (ii) but replace $Game_{jht}$ with $Game_{ht}$. For all such scenarios, the model is given by:

$$logit(\Pr(Y_{ijht} = 1|\theta_{jh}, \lambda_h)) = \beta_0 + \beta_1 Post_{ht} + \beta_2 x_{ijht} + \beta_{3t} + \beta_4 Game_{*ht} + \theta_{jh} + \lambda_h$$

where the * implies that the presence or absence of the *j* subscript distinguishes the scenarios when $Game_{jht}$ and $Game_{ht}$ are used respectively. It is important ot note that the model retains $Post_{ht}$ as a predictor in order to allow for the possibility that the roll-out of the game affects outcomes even if physician(s) do not play the game.

Stata: melogit billed_acp patient_covariates epoch physician_exposure proportion_physicians_exposed || hosp: || md:, or

Secondary Outcomes and Analyses:

- Secondary outcomes (exploratory):
  - *Rate of ACP billing at hospitals in the 1-year following the trial*.

        - Hypothesis: billing rates at study hospitals will remain higher than at baseline.
    - *Mortality*. Identify mortality for patients treated at study hospitals.
        - Hypothesis: there will be no difference in mortality of patients treated at hospitals before and after deployment of the intervention.
    - *Resource utilization during index hospitalization*. Identify resources used for patients in the index hospitalization (will need to create the code for the various claims).
        - Hypothesis: resources used during index hospitalizations will be less if the hospitalization occurs after deployment of the intervention.
    - *Resource utilization during the 1-year after the index hospitalization.* Identify resources used for patients in the 1 year after the index hospitalization.
        - Hypothesis: patients whose index hospitalization occurred after deployment of the intervention will use fewer resources than patients who index hospitalization occurred before deployment.

The rate of ACP billing analysis, resource utilization and case vignette analyses involve uncensored binary outcomes and so will use the same approach as for earlier analyses. The mortality analysis may use the same structure but with a survival time model to account for censoring.

- Intermediate outcome (subsample).
    - *Chart review*. Using manual review of a subsample of patient charts from each provider, categorize patient charts as including ACP conversation or not; cross-check with whether ACP was billed or not. (Note: Post-doc Julia Chelen has a small internal grant under review that would develop a natural language processing algorithm for automating chart text review).

EFFECTIVENESS

We have designed the study to include two effectiveness arms. The data safety and monitoring plan and clinicaltrials.gov registration will include these arms; however, they are contingent upon receiving supplemental NBER funding.

Intervention Delivery

Peer-delivered: We will provide <u>one</u> physician with the game pre-loaded on an iPad, and ask them to use the game for >2 hours over the course of 1 month, then share information about the game with their peers (either sharing the iPad or providing peers with a link to the App on the iTunes store and a username and passcode). Note: TBD plan for identifying the "local champion" (Hospitalist chief? Hospitalist-chief nominated? Volunteer?)

Organization-delivered: A Sound representative will send an email to physicians with a link to the App on the iTunes store and a username and passcode).

Measured variables/outcomes:

A. Predictors:
    1. Demographics/personal characteristics: participant age, race/ethnicity, board certification, location of medical school, location of residency/fellowship, years in practice, number of patients evaluated/week of service, number of weeks on service/year. ACP rate of physician at baseline.
    2. Physician exposure to hospital-level ACP interventions not related to this trial.

3. Use of intervention: data pulled from MyAnalytics: time spent, number of encounters, cases completed, decisions made, feedback seen.

B. Clinical Outcomes
   1. Primary outcome: ACP billing in the quarter after intervention.
   2. Secondary outcomes [lagged availability of data]:
      a. Rate of ACP billing at study hospitals in the 1-year following the trial.
      b. Physician reported ACP conversations in MIPS (from Sound).
      c. Mortality. In-hospital mortality, 90-day mortality for patients treated at the hospitals during the study.
      d. Resource utilization during the index hospitalization. Length of stay, admission to ICU, mechanical ventilation, disposition status, tracheostomy, G-tube placement, new onset dialysis (assuming reliable way to capture), palliative care consults (assuming reliable way to capture).
      e. Resource utilization during the 1-year after the index hospitalization. Number of admissions to the hospital; use of post-acute care; use of hospice.

Sample size:

Peer-delivered: under development
Organization-delivered: under development

Key uncertainty, information needed, or action required	**Responsible person(s)**
Check sample size calculation (!)	Barnato, Mohan, O'Malley

Interim analyses and stopping guidelines: None

Randomization: Hospitals will be randomized to the order in which they receive the iPads loaded with intervention and outcome assessment materials.

Study protocol: When the site goes live, we will send iPads to the resource specialist nurse, so that s/he can distribute the devices to the hospitalist on staff. We will then contact each participant with information about the trial and the study tasks. We cannot blind study personnel and participants to the intervention after deployment. However, we will mask group assignment during the analysis phase. We will ask participants to use their intervention within two weeks of receipt for at least 2 hours. Participants will log into a website after using the intervention to report their demographics/personal characteristics, experience using the intervention (including engagement – discuss how to measure), and any qualitative usability/tolerability feedback. This would also be the time that they complete the case vignettes (if applicable). We anticipate that completing the questionnaires and the case vignettes will take about 1 hour. Participants will keep the iPad as an honorarium (approximate value: $200).

Statistical methods/Analysis plan

Primary outcome: ACP billing

Hypotheses:
H_a1: Hospital ACP billing rates in **peer-delivery** intervention hospitals will increase by at least X percentage points more than ACP billing rates in the control hospitals.

H_a2: The magnitude of the increase in the ACP billing rate at the hospital level will be associated with the fraction of the physicians exposed to the intervention.

H_a3: Hospital ACP billing rates in **organization-delivery** intervention hospitals will increase by at least X percentage points more than would be expected by secular trends alone [pre-post design]

… or …

H_a4: Growth in hospital ACP billing rates in the **organization-delivery** condition hospitals will be smaller than in **peer-delivery** condition hospitals [dif-in-dif design]

H_a5: The increase in ACP billing rates will be significantly different across intervention delivery methods: iPad delivery to all MDs > App URL delivery by peers > App URL delivery by organizational leadership.

Data analysis plan: The design for the Effectiveness analyses differs from that for the Efficiacy study in that the hospitals are randomly split between those who have a physician who participates in the game and those that have no such participating physician. The rationale for the alteration to the design is that there are many more randomization units. As such, the design panelty from using a parrallel groups design is much lower than if such a design was used for the Efficiacy study. All hospitals that do not partake in the Efficacy study will be included in this study. Because we wish to make comparisons to the hospitals in the Efficacy study, intervention group hospitals will have a 3-month pre-period. Therefore, we can make a difference-in-difference style comparison between the blanket intervention in the Effiacy. Together with the first two steps of the stepped-wedge design used for the Efficacy study, the single selected physician intervenion in the Effectiveness study, and the control of the Effectiveness study. The statistical model for this analysis is depicted as:

$$logit(\Pr(Y_{ijht} = 1|\theta_{jh}, \lambda_h)) = \beta_0 + \beta_1 Blanket_{ht} + \beta_2 Single_{ht} + \beta_3 x_{ijht} + \beta_{4t} + \theta_{jh} + \lambda_h$$

In the above model, the coefficients β_1 and β_2 represent the effect of a patient receiving care from a hospital that has made the game available to all of its physicians versus not having the game and of making the game available to a single physician of high importance versus not having game, respectively. The above model addresses H1, H3, H4 and H5 with a composite hypothesis test being used for H5. We data for the three-way comparison will be limited to that from hospitals that fall within the eligibility criteria of the Efficacy study hospitals. However, we will also estimate a reduced version of the above model in which the Single physician intervention of the Effectiveness study is compared to the control arm of the Effectiveness study using all participating hospitals in that study.

Extended analyses: Analogous to the Effectiveness study, the above model can be augmented with measures of whether the game was been played by the concerned physicians in order to respond to hypotheses H2. We will also extend the model in another direction by allowing the effect of the single physician intervention to vary based on the role of that physician (Chief, Hospitalist, Respondent to social network survey, volunteer, physician nominated by the chief, a randomly chosen physician). The actions described for the primary analysis for patients who encounter multiple physicians will also be considered for these analyses.