Effect of chair placement on physicians' behavior and patients' satisfaction: randomized deception trial

Ruchita Iyer,[1] Do Park,[2] Jenny Kim,[1] Courtney Newman,[1] Avery Young,[1] Andrew Sumarsono[2,3]

[1]University of Texas Southwestern Medical School, Dallas, TX, USA

[2]Department of Internal Medicine, University of Texas – Southwestern Medical Center, Dallas, TX 75390, USA

[3]Division of Hospital Medicine, Parkland Health, Dallas, TX, USA

Correspondence to: A Sumarsono adsumarsono@gmail.com (ORCID 0000-0002-2959-6958)

Additional material is published online only. To view please visit the journal online.

Cite this as: *BMJ* 2023;383:e076309
http://dx.doi.org/10.1136/bmj-2023-076309

Accepted: 11 August 2023

ABSTRACT

OBJECTIVE
To evaluate the effect of chair placement on length of time physicians sit during a bedside consultation and patients' satisfaction.

DESIGN
Single center, double blind, randomized controlled deception trial.

SETTING
County hospital in Texas, USA.

PARTICIPANTS
51 hospitalist physicians providing direct care services, and 125 observed encounters of patients who could answer four orientation questions correctly before study entry, April 2022 to February 2023.

INTERVENTION
Each patient encounter was randomized to either chair placement (≤3 feet (0.9 m) of patient's bedside and facing the bed) or usual chair location (control).

MAIN OUTCOME MEASURES
The primary outcome was the binary decision of the physician to sit or not sit at any point during a patient encounter. Secondary outcomes included patient satisfaction, as assessed with the Tool to Assess Inpatient Satisfaction with Care from Hospitalists (TAISCH) and the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) surveys, time in the room, and both physicians' and patients' perception of time in the room.

RESULTS
125 patient encounters were randomized (60 to chair placement and 65 to control). 38 of the 60 physicians in the chair placement group sat during the patient encounter compared with five of the 65 physicians in the control group (odds ratio 20.7, 95% confidence interval 7.2 to 59.4; P<0.001). The absolute risk difference between the intervention and control groups was 0.55 (95% confidence interval 0.42 to 0.69). Overall, 1.8 chairs needed to be placed for a physician to sit. Intervention was associated with 3.9% greater TAISCH scores (effect estimate 3.9, 95% confidence interval 0.9 to 7.0; P=0.01) and 5.1 greater odds of complete scores on HCAHPS (95% confidence interval 1.06 to 24.9, P=0.04). Chair placement was not associated with time spent in the room (10.6 minutes *v* control 10.6 minutes) nor perception of time in the room for physicians (9.4 minutes *v* 9.8 minutes) or patients (13.1 minutes *v* 13.5 minutes).

CONCLUSION
Chair placement is a simple, no cost, low tech intervention that increases a physician's likelihood of sitting during a bedside consultation and resulted in higher patients' scores for both satisfaction and communication.

TRIAL REGISTRATION
ClinicalTrials.gov NCT05250778.

WHAT IS ALREADY KNOWN ON THIS TOPIC
Choice architecture, such as specific designs for patients' rooms, can influence physicians' behavior

The etiquette behaviors of physicians, such as sitting while with a patient, positively impact on patients' satisfaction

Despite this evidence, physicians rarely sit at bedsides

WHAT THIS STUDY ADDS
A simple, low cost nudge such as placing a chair at a patient's bedside, can increase a physician's likelihood to sit by 20-fold

Such a nudge can also improve patients' perceptions of their physician

Introduction

Etiquette based medicine is a practice that emphasizes good manners and behaviors when communicating with patients, and such practice has been shown to have a beneficial effect on the physician-patient relationship.[1-3] Sitting at the bedside of a patient is one of the etiquette behaviors that has been associated with improved patient-physician communication, patients' satisfaction, and trust.[1 2 4] In the midst of busy rounds, however, it might be a challenge for healthcare professionals to sit with patients on a regular basis, with previous studies finding that hospitalist physicians sit during one in five encounters with patients.[2] Despite the evidence suggesting that sitting with patients is beneficial, identifying ways to change physicians' behavior is complex.

A nudge is defined as an attempt to predictably influence an individual's judgment, choice, or behavior by targeting subconscious routines and biases present in decision making.[5 6] Nudges have been successfully leveraged to modify physicians' behavior and have resulted in, for example, increased flu vaccination rates and more frequent prescribing of statins [7 8] Choice architecture is a specific nudge strategy that influences the social and physical environment in which decisions are made. Choice architecture studies have shown that intentional placement of healthier food options improves health conscious decisions without any specific interaction with consumers.[9-11] Previous studies in the hospital setting have shown that nudges such as visual cues and fresh scents can increase hand hygiene behaviors.[12-14] Several reviews have also shown that electronic nudges can improve clinical decision making when refilling prescriptions, placing laboratory test orders, and performing preventive health screenings.[5 15] Thus, nudges and choice architecture may be effective in influencing subconscious behaviors during rounds, such as physicians sitting while with patients.

Using these behavioral change concepts, we hypothesized that utilizing choice architecture could affect physicians' behavior and improve patients' perceptions of their physician. As such, we conducted a single center randomized deception trial to determine the effect of chair placement on physicians' sitting rates and patients' satisfaction.

Methods

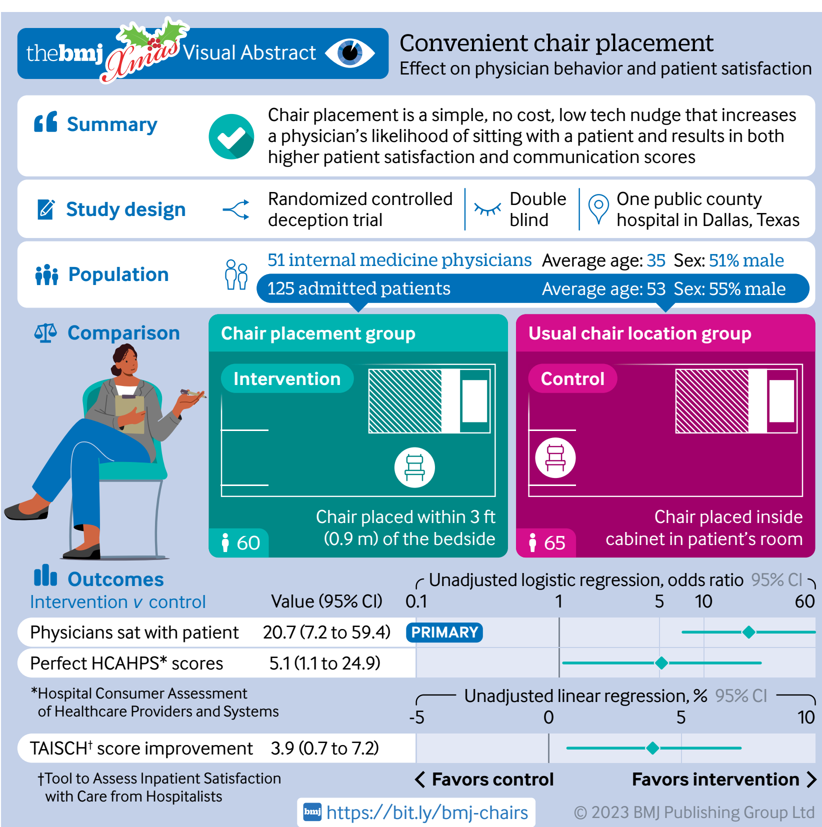
Study design

This was a single center, double blind, randomized controlled deception trial to assess the effect of chair placement on hospitalist physicians' sitting behavior and patients' experience. Deception studies purposefully withhold some information from participants to assess outcomes that may otherwise be influenced by knowledge of the study's objective. The study was conducted at Parkland Memorial Hospital, the public county hospital in Dallas, Texas, United States, and data were collected between April 2022 and February 2023.

Study population and recruitment

Hospitalists and patients

All board certified internal medicine hospitalists providing direct care services—non-teaching services (that is, without medical students or resident trainees) were eligible to participate. The observations



occurred during usual care provided by the hospitalist physicians. Typical topics discussed during these visits included clinical updates, daily medical management plans, care coordination, discharge planning, and answering questions.

Patients were eligible to participate if they could answer four orientation questions correctly. They were observed in their usual state in the hospital room—most commonly reclining or sitting upright in bed.

All encounters in patients without covid-19 were eligible for inclusion in the study. Exclusion criteria for encounters were based on the characteristics of the patient's room, such as double occupancy or lack of chairs.

Randomization and deception

An independent statistician generated a randomization key using simple randomization under a 1:1 fixed allocation schedule to assign encounters to either chair placement or usual chair location (control) (fig 1).

Hospitalist physicians were informed that the aim of the study was to observe variation in practice and to provide medical students on the research team with an opportunity to expand their experience of inpatient internal medicine. The rationale was to reduce the likelihood that hospitalists would change their behavior if they were aware of the actual purpose of the study. At the end of the study, the physicians were asked to describe what they thought was the main aim of the study.

Patients were informed that the purpose of the study was to investigate the practice patterns of physicians and patients' satisfaction, with no mention of the chair component. The rationale was to reduce the risks of response bias (ie, knowledge about the intervention arm could influence how patients rated their physician) and unblinding of the physicians (ie, patients might mention the aim of the study to their hospitalist physician in subsequent encounters).

Intervention

The intervention arm comprised chair placement (fig 1), defined as positioning the chair within 3 feet (0.9 m) of the bedside and facing the bed. The control arm was the chair left in its usual location (fig 1).

Study team

The study team comprised four medical students (RI, JK, CN, AY) who were responsible for data collection, one medical resident (DP) who was responsible for data adjudication, and one internal medicine faculty member. Medical students were specifically chosen to conduct the study observations on the presumption they would be less intimidating than residents or faculty staff when assessing physicians' behavior. The principal investigator trained the medical students on how to conduct each step of the study protocol, and the students practiced filling out mock data collection sheets through non-study observed patient encounters with the principal investigator. Team members were incentivized to work on this study using dedicated didactics involving randomized trials and free team lunches. At these lunches, the principal investigator investigated compliance with the study protocol on the pretext of team building.

Study procedures

Supplemental figure 1 and the supplemental methods provide a detailed description of the study procedures and sample data collection sheets. A medical student contacted the participating hospitalist physicians to schedule observed encounters. The student ensured the room met the eligibility criteria for encounters then used the REDCap randomization schedule to assign the encounter to chair placement or usual chair location. In Parkland Memorial Hospital, chairs are usually stored in a small cupboard with the door closed (fig 1). The student placed the chair in the intervention position and sat for introductions with the patient before the observed encounter. Before leaving the room, the student left the chair in the intervention position or returned it to the usual location on the basis of group assignment. The student then met the participating physician outside the room, obtained verbal consent for participation in the study, and collected personal information. The student observed the patient encounter silently from the corner of the room and collected data on the physician's sitting behavior, time in the room, and general etiquette such as knocking before entering the room and making introductions. Observed encounters only included the physician, patient (with or without family members), and student. After the encounter, the student left the room with the physician and administered an exit questionnaire comprising distractor questions unrelated to the primary outcome of the study, including perceived time in the room, perceived communication with the patient, and perceived understanding of the patient. The student then returned to the room to obtain the patient's verbal consent and to ask questions about experiences with the encounter. Patients were given the option for the satisfaction surveys to be administered on paper or verbally. Patients' personal characteristics and reason for hospital admission were collected through chart review and verified by two team members. To reduce the likelihood of intra-day correlation as a result of being observed or being assigned to either study arm, hospitalists could only be observed once each day. Each patient could only participate in the study once.

Fig 1 | Visualization of chair nudge. Chair placement (top) and usual chair location (bottom)

Outcomes

The prespecified primary outcome was the binary decision of the physician to sit or not sit during the observed encounter. The outcome was considered positive if the physician sat on a chair or the patient's bed. The prespecified secondary outcome was patients' satisfaction, measured using the Tool to Assess Inpatient Satisfaction with Care from Hospitalists (TAISCH) and the three physician communication related questions in the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) questionnaire.[16 17] The TAISCH survey is a validated instrument with 15 questions on a 5 point Likert scale to assess patients' satisfaction with hospitalist care across the six domains of physician availability, concern, communication, courteousness, clinical skills, and involvement with the patient's family. The HCAHPS survey is a postal questionnaire used by the Centers for Medicare and Medicaid Services to assess patients' satisfaction scores in the US. The TAISCH outcome was reported as a percentage of total points (range 0-100%). Incomplete TAISCH questionnaires were excluded from analysis. The physician component of HCAHPS comprises three questions on a 4 point Likert scale. Given the heavy skew towards complete scores, HCAHPS patient satisfaction was dichotomized into complete score (12 out of 12 possible points) versus not complete score. The prespecified exploratory outcomes were actual time spent in the room, hospitalist physicians' perceived time in the room, and patients' perception of physicians' time in the room.

Statistical analysis

Using previously published data, we estimated that hospitalists typically sit for 20% of encounters.[2 18] In our a priori power calculation, we estimated that 253 observed encounters would be needed to detect

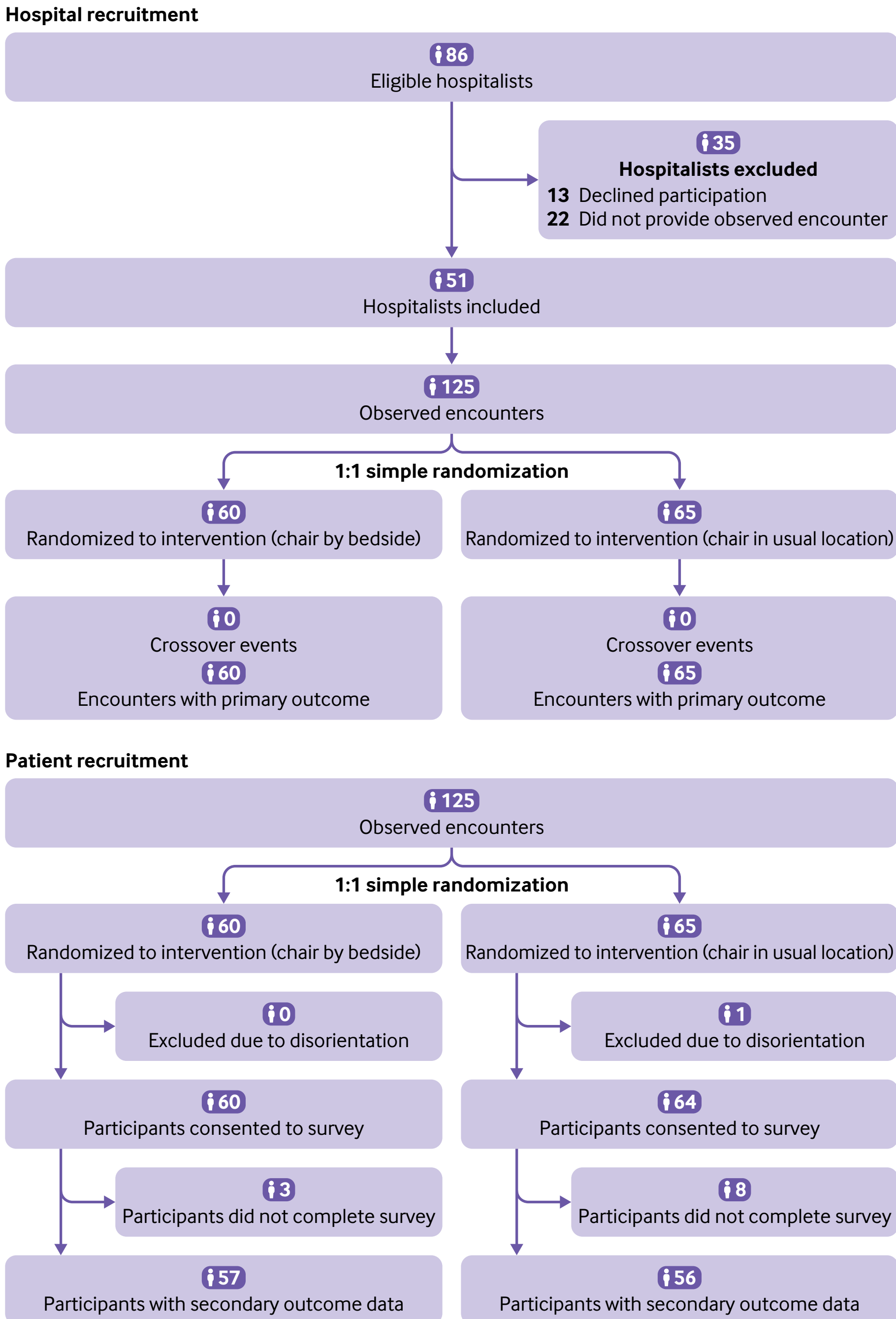


Fig 2 | Flow of hospitalists through study

a doubling of hospitalist physician sitting proportion to 40%, assuming a power of 0.80, type 1 error of 0.05, and a crossover rate of 20% as a result of chair displacement between randomization and observation. After 60 observed encounters, a 0% crossover rate was observed and thus we modified the crossover assumption to 5%, resulting in a reduction to 180 required observed encounters. Despite this reduction, we were unable to reach 180 encounters and the study was terminated early owing to diminishing recruitment over the last three months of data collection (see supplemental figure 2).

All analyses were performed using the intention-to-treat principle. Summary statistics were used to describe the characteristics of the hospitalist physicians and patients at encounter level. The effect of chair placement on hospitalists' sitting behavior was estimated using logistic regression models, and linear and logistic regression models were used to estimate the effect on TAISCH and HCAHPS scores, respectively. Sensitivity analyses using generalized estimating equations and generalized linear mixed models were constructed to account for the potential correlation between observations in the same physician. Logistic regression models were used to evaluate the effect of chair placement on each individual component of the TAISCH patient satisfaction questionnaire. Prespecified exploratory analyses evaluated the effect

Table 1 | Characteristics of hospitalist physicians by randomization group. Values are number (percentage) unless stated otherwise

Characteristics	Chair placement (n=60)	Usual chair location (n=65)
Mean (SD) age (years)	34 (4)	36 (6)
Men	35 (58)	32 (49)
Race*:		
White	28 (47)	36 (55)
Non-white groups	32 (53)	29 (45)
Mean (SD) years post-residency	5 (4)	6 (5)

SD=standard deviation.
Race variables (black, Asian (defined as individuals with backgrounds from South Asia, East Asia, and Southeast Asia), and other) were combined into non-white race because individual cells had <5 observations. The ethnicity of hospitalists was not reported because individual cells had <5 observations.
*19 (32%) participants in the chair placement arm and 29 (44%) in the usual chair location arm spoke Spanish as well as English.

of chair placement on other etiquette behaviors of the physician, and on perceptions of time. Using the previously described models, we also conducted an exploratory analysis to evaluate the association of sitting with patients' satisfaction.

A P value <0.05 was considered to be statistically significant. All data were collected using REDCap, analyses were conducted using SAS version 9.4.

Patient and public involvement

No patients were involved in the development of outcomes or review of our manuscript. We were unable to involve patients and members of the public in this study owing to a lack of funding and expertise in conducting patient and public involvement focus groups. Although there was no direct involvement of patients or members of the public in this paper, the clinical investigators' clinical practice with patients admitted to hospital informed the design and rationale of this study.

Results

Hospitalist physicans' personal and encounter characteristics

Overall, 51 hospitalist physicians participated in the study (fig 2), with a mean age of 36 years and a mean six years of clinical practice post-residency. Overall, 51% of the physicians were men. All the physicians spoke English; however, a third (33%) also spoke Spanish. Supplemental table 1 provides a breakdown of individual characteristics of the physicians.

Participating physicians were observed for a total of 125 encounters. Sixteen (13%) encounters required an interpreter. Sixty encounters were randomized to the chair placement arm and 65 to the usual chair location arm. Table 1 shows the distribution of the characteristics of the hospitalist physicians by randomization group. Differences in the physicians' characteristics, including sex and race between groups, were not statistically significant. Overall, 5% of physicians correctly stated the purpose of the study after data collection was completed.

Primary outcome: effect of chair placement on physicians' sitting behavior

The physicians sat in 43 of the 125 (34%) encounters. They spent an average of 9.8 minutes (standard deviation (SD) 12.5 minutes) sitting with the patient.

In the chair placement group, 38 of the 60 physicians sat during the patient encounter, compared with five of 65 physicians in the control group (table 2). In unadjusted logistic regression, the odds ratio was 20.7 (95% confidence interval 7.2 to 59.4), P<0.001). We observed similar estimates in both generalized estimating equations (20.7, 7.5 to 57.6, P<0.001) and mixed logistic regression models (32.4, 8.8 to 119.9, P<0.001). The absolute risk difference between the chair placement group and control group was 0.55 (95% confidence interval 0.42 to 0.69). Overall, 1.8 chairs needed to be placed for a hospitalist physician to sit.

Effect of chair placement on other behaviors of physicians

Overall, physicians consistently knocked on the door of a patient's room before entering (98%) and introducing themselves (69%). Chair placement had no statistically significant impact on other behavior of the physicians, such as introducing themselves when entering the room (chair placement 65% *v* control 72%), knocking before entering the room (100% *v* 95%), explaining their role in the patient's care (52% *v* 46%), offering a handshake (13% *v* 15%), asking patients how they felt about their illness and hospital admission (50% *v* 45%), and offering to update or speak with the family (25% *v* 26%) (see supplemental table 2).

Patients' characteristics

Of the 125 observed encounters, 124 patients participated in the post-encounter survey (fig 2). One patient was not able to answer the orientation screening questions and was ineligible to complete the patient survey. Overall, the mean age was 53.3 (SD 16.5) years and 54% were men (table 3). More than a third of patients were of Hispanic ethnicity (44/125), more than 40% were of black race, and 18% spoke Spanish. Fifty two per cent were covered by the Parkland financial assistance plan, 21% by Medicare, 6% by private insurance, and 13% by Medicaid, and 8% were not insured. The most prevalent comorbidities were diabetes (51%), chronic kidney disease (37%), and obesity (31%).

Sixty encounters with patients were randomized to the chair placement arm and 65 to the control arm. Surveys were completed by 57 participants in the chair placement arm and 58 in the control arm. No statistically significant differences were found between the two groups in personal characteristics,

Table 2 | Primary outcome: impact of chair positioning on hospitalist sitting between chair placement arm (n=38/60) and usual chair location arm (n=5/65)

Models	Chair placement v usual chair location: odds ratio (95% CI)	P value
Logistic regression	20.7 (7.2 to 59.4)	<0.001
Generalized estimating equation*	20.7 (7.5 to 57.6)	<0.001
Mixed logistic regression*	32.4 (8.8 to 119.9)	<0.001

CI=confidence interval.
*Models account for correlation of observations from the same hospitalist.

Table 3 | Characteristics of the patients by randomization group. Values are number (percentage) unless stated otherwise

Characteristics	Chair placement (n=60)	Usual chair location (n=64)
Mean (SD) age (years)	53 (15)	53 (18)
Men	32 (53)	36 (55)
Race/ethnicity:		
White	29 (48)	39 (60)
Non-white groups	31 (52)	26 (40)
Hispanic	19 (32)	25 (38)
Speaks Spanish	12 (20)	10 (15)
Comorbidities:		
Coronary artery disease, heart failure	20 (33)	14 (22)
Chronic obstructive pulmonary disease, asthma	16 (27)	16 (25)
Chronic kidney disease	19 (32)	27 (42)
Chronic liver disease	11 (18)	11 (17)
Diabetes	25 (42)	26 (40)
Obesity	17 (28)	22 (34)
Chronic mental illness	16 (27)	23 (35)
Mean (SD) length of stay on day of encounter (days)	7.4 (6.4)	6.2 (4.9)
Mean (SD) consecutive days seen by observed hospitalist	1.6 (1.4)	1.9 (1.8)

SD=standard deviation.
Race variables (black, Asian (defined as individuals with backgrounds from South Asia, East Asia, and Southeast Asia), and other) were combined into non-white race because individual cells had <5 observations.
*12 (20%) participants in the chair placement arm and 10 (15%) in the usual chair location arm spoke Spanish as well as English.

comorbidities, and number of hospital days. No falls were reported in either group.

Effect of chair placement

Patients' satisfaction

The overall mean TAISCH score was 86.0% (SD 8.9%). The average TAISCH score was 88.0% (SD 8.9%) for the chair placement group and 84.1% (9.1%) for the control group. In unadjusted linear regression, chair placement was associated with 3.9% improvement in TAISCH patient satisfaction (effect estimate 3.9, 95% confidence interval 0.7 to 7.2, P=0.02) (table 4). Robustness testing using mixed linear regression models (effect estimate 3.7, 0.5 to 7.0, P=0.02) and generalized estimating equations (3.9, 0.9 to 7.0, P=0.01) yielded similar results. When the individual components of the TAISCH survey were evaluated, patients in the chair placement arm were more likely to feel both confident in the physician's plan (58% *v* 35%, P=0.01) and informed about their care plans (72% *v* 52%, P=0.03) (table 5).

HCAHPS physician scores were complete for 91% of the encounters. The chair placement group had 97% of complete HCAHPS scores, whereas the control group had 85%. In unadjusted logistic regression, chair placement was associated with 5.13 greater odds of complete HCAHPS scores (95% confidence interval 1.06 to 24.9, P=0.04). Robustness testing using mixed logistic regression models (5.13, 1.09 to 25.6, P=0.05) and generalized estimating equations (5.13, 1.09 to 24.1, P=0.04) yielded similar results.

Table 4 | Chair placement on patients' satisfaction

Models	TAISCH: % increase in score* (95% CI)	TAISCH: P value	HCAHPS: Odds ratio† (95% CI)	HCAHPS: P value
Linear regression	3.9 (0.7 to 7.2)	0.02	–	–
Logistic regression	–	–	5.13 (1.06 to 24.9)	0.04
Generalized estimating equation	3.9 (0.9 to 7.0)	0.01	5.13 (1.09 to 24.1)	0.04
Mixed linear regression	3.7 (0.5 to 7.0)	0.02	5.13 (1.03 to 25.6)	0.05

CI=confidence interval; HCAHPS=Hospital Consumer Assessment of Healthcare Providers and Systems; TAISCH=Tool to Assess Inpatient Satisfaction with Care from Hospitalists.
Generalized estimating equations and mixed linear/logistic regressions account for observations from the same hospitalist.
*Per cent of total points.
†Complete score versus incomplete score.

Knowledge

Sixteen (27%) patients in the chair placement group were able to successfully name their hospitalist physician compared with 14 (22%) in the control group (P=0.67). Fifty (83%) patients in the chair placement group were able to successfully identify their reason for hospital admission compared with 48 (76.2%) patients in the control group (P=0.37).

Perceptions of time

The average duration of encounters was 10.6 minutes in the chair placement group and 10.6 minutes in the control group (P=0.96) (see supplemental table 3). Chair placement was not associated with a difference in perception of encounter duration for physicians (9.4 minutes *v* control 9.8 minutes, P=0.60) or patients (13.1 minutes *v* 13.5 minutes, P=0.74).

Patient outcomes

In a sensitivity analysis, we found that hospitalists sitting was associated with a 4.9% improvement in patients' satisfaction (see supplemental table 4). No differences were, however, found in patients' ability to name their physician (P=1.0), ability to successfully identify their reason for hospital admission (P=0.82), or perceptions of time (P=0.2) (see supplemental table 5).

Discussion

In this randomized controlled deception study, we found that a simple, no cost nudge of conveniently placing a chair by a patient's bedside can statistically significantly affect the behavior of hospitalist physicians and patients' satisfaction. With this nudge, physicians were substantially more likely to sit during patient encounters (63%) compared with a control group where the chair was left in its usual location (8%). Additionally, physicians who were nudged received higher TAISCH and patient communication HCAHPS scores. Our findings highlight how choice architecture within hospital rooms can change physicians' behavior and improve the experience of patients.

Comparison with other studies

We used behavioral intervention strategies of choice architecture and nudges to influence physician sitting. Studies in the emergency room have used similar intervention strategies and found that placing a conspicuous chair in the room was associated with improvements in physicians' behavior.[19] Sitting rates in the inpatient setting are low, however, with hospitalist physicians and trainees sitting in 20% and less than 10% of patient encounters, respectively.[2 18]

Table 5 | Questions included in TAISCH patient satisfaction questionnaire

	Proportion with top rated answer* (%)		
Questions	Chair placement	Usual chair location	P value
How do you rate X's compassion, empathy, and concern for you?	43	34	0.36
How do you rate X's ability to communicate with you?	50	35	0.11
How do you rate X's skill in diagnosing and treating your medical conditions?	43	31	0.19
How do you rate X's fund of knowledge?	43	37	0.47
How much confidence do you have in X's plan for your care?	58	35	0.01
X kept me informed of the plans for my care	72	52	0.03
How well has X done in getting you ready to be discharged from the hospital?	40	35	0.72
X let me talk without interrupting	78	66	0.16
X encouraged me to ask questions	73	66	0.44
X checked to be sure I understood everything	82	75	0.51
I sensed X was in a rush when she/he was with me (reverse coded)	55	51	0.72
X showed interest in my views and opinions about my health	62	57	0.72
X discusses options with me and involves me in decision making	70	57	0.14
X asked permission to enter the room and waited for an answer	78	78	1.0
X sat down when she/he visited my bedside	43	14	<0.001

*Received top score on a 5 point Likert scale.

The most cited reason for not sitting was inaccessibility of a chair.[4] In our study, despite a chair being readily available and within a few feet of the bedside in both groups, significant differences in sitting were observed, suggesting that chair accessibility itself was inadequate to drive behavior and physicians needed nudging. Indeed, we found that the impact of a simple nudge on physicians' behavior increased the odds of sitting by 20-fold and that only 1.8 chairs needed to be moved to result in a physician sitting.

We also find that an environmental nudge designed to have an impact on a physician's etiquette can have important implications on patients' experience. This is consistent with research in the health environments and design literature, which has shown that physical design characteristics such as cleanliness of a room, ambient noise, and visibility or location from a nursing station can have an impact on patients' satisfaction.[20] One study found that the spatial orientation of rooms was associated with improvements in patients' perceptions of their physician's skill, courtesy, and compassion.[21] In our study, patients of nudged physicians reported they felt more confident in their physician's plan and more informed about their care. Moreover, we found that nudged physicians received 4% higher patient satisfaction scores and were five times more likely to receive a complete HCAHPS physician score. Indeed, nearly all individual measures of the TAISCH survey favored the intervention arm. Although these measures did not reach statistical significance owing to our small sample size, it is possible that a larger study could find more benefits of room design nudges than described here. Aside from sitting behavior, nudged physicians displayed similar behaviors to the control group, both for etiquette measures and for time spent in the room. Furthermore, compared with patients of control physicians, patients of intervention physicians performed similarly for correctly naming their physicians, understanding their reason for hospital admission, or estimating the time the physician spent in the room. Taken together, these results suggest that intentional chair positioning can positively influence patients' perceptions of their physician, even though patients show no measurable improvement in knowledge or perceived time in the room.

Our study further illustrates the benefit of physicians sitting on patients' experience. In our sensitivity analyses, we find sitting with a patient was associated with a 5% increase in the satisfaction of patients. This finding is consistent with that of other studies where the posture of physicians has been examined.[19 22] In previous studies, patients perceived physicians who sat to be more compassionate, more caring, and more encouraging of questions.[23 24] Additionally, we observed that patients consistently overestimated the time a physician was in the room by about 2.5 minutes, but that the degree of overestimation was similar between physicians who sat and those who did not sit. This contrasts with evidence in the emergency room setting, where it was found that patients over-estimated encounter duration when physicians sat and under-estimated encounter durations when physicians stood, but the finding is consistent with findings in the inpatient setting.[22 24-26]

Implications of the findings

Our findings have multiple implications for hospital administration and researchers. First, we showed that effective nudges can be free and of low tech. This is especially impactful in a resource constrained setting such as the safety net hospital of this study and shows the potential for improving care delivery at minimal cost. Second, nudges leveraging choice architecture do not cause interruption to the hospitalist physicians' workflow and require no explicit instructions yet were highly effective in affecting behavior. Not all behavior interventions are as benign or effective; inpatient clinical decision support alerts often interrupt a physician's workflow and have been fraught with poor uptake and high ignore rates.[27 28] As such, nudges that focus on subconscious behavior could be a feasible option to change behaviors at little appreciable disadvantage to physicians. Third, given the importance of patients' satisfaction on Medicare reimbursement, it is possible that small nudges that improve patients' experiences can result in substantial financial gains for hospitals.[29] Lastly, we showed the feasibility of testing behavioral intervention designs using deception in the inpatient setting. Similar studies can leverage our methodology to test the impacts of other nudges in their clinical settings.

Strengths and limitations of this study

This study had multiple strengths. Most studies evaluating the association of sitting and patients' satisfaction are unblinded and susceptible to observation bias; however, our study leveraged deception and multiple distractor questions in its design.[4 22 26 30] At the end of the study, only 5% of physicians correctly identified the true purpose of the study, suggesting successful blinding and thereby increasing the validity of our findings. Randomization ensured that confounding factors, such as a physician's propensity to sit, were equally distributed between both groups. Our findings are robust and provide nearly identical results across multiple statistical analyses and assumptions.

Several limitations also need to be mentioned. First, this study was performed in a single county hospital with single occupancy rooms, thus our findings may be less generalizable to other hospitals. We suspect, however, that nudges to improve the convenience of sitting in other contexts would likely result in similar results. Second, our findings on patients' satisfaction may be less generalizable because our data collection method and response rates were different from the real world HCAHPS surveys delivered by mail. Third, we could not collect the calculated 180 encounters for our study owing to slow recruitment of encounters, and thus it is possible that the study may have been underpowered to detect differences in our secondary outcomes of patients' knowledge and perceived time. Fourth, we were limited in our ability to conduct pilot studies because of the deception component of this study, and thus we were fortunate that the effect size was larger than estimated, enabling us to detect positive findings despite a smaller-than-expected sample size. Lastly, our study was susceptible to observer bias, but such a challenge should be equally distributed between the two study groups.

Conclusions

In this deception, randomized study a no cost, low tech nudge of chair placement significantly increased a hospitalist physician's likelihood of sitting with a patient at no cost to the hospital or disadvantage to the physician. Future work should leverage behavioral intervention strategies to improve care delivery in healthcare settings.

We acknowledge Bhumika Maddineni, an independent statistician who developed our randomization key.

Contributors: RI contributed to data collection, staff training, manuscript drafting, critical feedback, and revision of the manuscript. JK contributed to data collection, staff training, and critical feedback of the manuscript. CN and AY contributed to data collection and critical feedback of the manuscript. DP contributed to data verification and critical feedback of the manuscript. AS contributed to the study design, staff training, data analysis, drafting of the manuscript, and critical feedback and revision of the manuscript. AS is the guarantor of data and integrity of this study. The corresponding author attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted.

Funding: None received.

Competing interests: All authors have completed the ICMJE uniform disclosure form at www.icmje.org/disclosure-of-interest/ and declare: no support from any organization for the submitted work; no financial relationships with any organizations that might have an interest in the submitted work in the previous three years; no other relationships or activities that could appear to have influenced the submitted work.

Ethical approval: The trial protocol was approved by the University of Texas Southwestern institutional review board (STU-2021-1057) and was registered on ClinicalTrials.gov (NCT05250778).

Data sharing: No additional data available.

The lead author (AS) affirms that the manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

Dissemination to participants and related patient and public communities: The authors plan to work with UT Southwestern's media team to publish a press release with the findings of this study. This work will also be presented at internal research conferences and will be submitted as a research abstract to the Society of General Internal Medicine conference.

Provenance and peer review: Not commissioned; externally peer reviewed.

1 Swayden KJ, Anderson KK, Connelly LM, Moran JS, McMahon JK, Arnold PM. Effect of sitting vs. standing on perception of provider time at bedside: a pilot study. *Patient Educ Couns* 2012;86:166-71. doi:10.1016/j.pec.2011.05.024
2 Tackett S, Tad-y D, Rios R, Kisuule F, Wright S. Appraising the practice of etiquette-based medicine in the inpatient setting. *J Gen Intern Med* 2013;28:908-13. doi:10.1007/s11606-012-2328-6
3 Kahn MW. Etiquette-based medicine. *N Engl J Med* 2008;358:1988-9. doi:10.1056/NEJMp0801863
4 Golden BP, Tackett S, Kobayashi K, et al. Sitting at the Bedside: Patient and Internal Medicine Trainee Perceptions. *J Gen Intern Med* 2022;37:3038-44. doi:10.1007/s11606-021-07231-4
5 Yoong SL, Hall A, Stacey F, et al. Nudge strategies to improve healthcare providers' implementation of evidence-based guidelines, policies and practices: a systematic review of trials included within Cochrane systematic reviews. *Implement Sci* 2020;15:50. doi:10.1186/s13012-020-01011-0
6 Lin Y, Osman M, Ashcroft R. Nudge: concept, effectiveness, and ethics. *Basic Appl Soc Psych* 2017;39:293-306. doi:10.1080/01973533.2017.1356304.
7 Johansen ND, Vaduganathan M, Bhatt AS, et al. Electronic nudges to increase influenza vaccination uptake in Denmark: a nationwide, pragmatic, registry-based, randomised implementation trial. *Lancet* 2023;401:1103-14. doi:10.1016/S0140-6736(23)00349-5
8 Kim RH, Day SC, Small DS, Snider CK, Rareshide CAL, Patel MS. Variations in Influenza Vaccination by Clinic Appointment Time and an Active Choice Intervention in the Electronic Health Record to Increase Influenza Vaccination. *JAMA Netw Open* 2018;1:e181770. doi:10.1001/jamanetworkopen.2018.1770
9 Foster GD, Karpyn A, Wojtanowski AC, et al. Placement and promotion strategies to increase sales of healthier products in supermarkets in low-income, ethnically diverse neighborhoods: a randomized controlled trial. *Am J Clin Nutr* 2014;99:1359-68. doi:10.3945/ajcn.113.075572
10 Hollands GJ, Carter P, Anwer S, et al. Altering the availability or proximity of food, alcohol, and tobacco products to change their selection and consumption. *Cochrane Database Syst Rev* 2019;9:CD012573.
11 Bucher T, Collins C, Rollo ME, et al. Nudging consumers towards healthier choices: a systematic review of positional influences on food choice. *Br J Nutr* 2016;115:2252-63. doi:10.1017/S0007114516001653

12 Birnbach DJ, King D, Vlaev I, Rosen LF, Harvey PD. Impact of environmental olfactory cues on hand hygiene behaviour in a simulated hospital environment: a randomized study. *J Hosp Infect* 2013;85:79-81. doi:10.1016/j.jhin.2013.06.008
13 King D, Vlaev I, Everett-Thomas R, Fitzpatrick M, Darzi A, Birnbach DJ. "Priming" hand hygiene compliance in clinical environments. *Health Psychol* 2016;35:96-101. doi:10.1037/hea0000239
14 Caris MG, Labuschagne HA, Dekker M, Kramer MHH, van Agtmael MA, Vandenbroucke-Grauls CMJE. Nudging to improve hand hygiene. *J Hosp Infect* 2018;98:352-8. doi:10.1016/j.jhin.2017.09.023
15 Sant'Anna A, Vilhelmsson A, Wolf A. Nudging healthcare professionals in clinical settings: a scoping review of the literature. *BMC Health Serv Res* 2021;21:543. doi:10.1186/s12913-021-06496-z
16 Centers for Medicare & Medicaid Services. HCAHPS: Patients' perspectives of care survey. https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/HospitalQualityInits/HospitalHCAHPS. 2023.
17 Torok H, Ghazarian SR, Kotwal S, Landis R, Wright S, Howell E. Development and validation of the tool to assess inpatient satisfaction with care from hospitalists. *J Hosp Med* 2014;9:553-8. doi:10.1002/jhm.2220
18 Block L, Hutzler L, Habicht R, et al. Do internal medicine interns practice etiquette-based communication? A critical look at the inpatient encounter. *J Hosp Med* 2013;8:631-4. doi:10.1002/jhm.2092
19 Orloski CJ, Tabakin ER, Shofer FS, Myers JS, Mills AM. Grab a Seat! Nudging Providers to Sit Improves the Patient Experience in the Emergency Department. *J Patient Exp* 2019;6:110-6. doi:10.1177/2374373518778862
20 MacAllister L, Zimring C, Ryherd E. Environmental Variables That Influence Patient Satisfaction: A Review of the Literature. *HERD* 2016;10:155-69. doi:10.1177/1937586716660825
21 MacAllister L, Zimring C, Ryherd E. Exploring the Relationships Between Patient Room Layout and Patient Satisfaction. *HERD* 2019;12:91-107. doi:10.1177/1937586718782163
22 Merel SE, McKinney CM, Ufkes P, Kwan AC, White AA. Sitting at patients' bedsides may improve patients' perceptions of physician communication skills. *J Hosp Med* 2016;11:865-8. doi:10.1002/jhm.2634
23 Bruera E, Palmer JL, Pace E, et al. A randomized, controlled trial of physician postures when breaking bad news to cancer patients. *Palliat Med* 2007;21:501-5. doi:10.1177/0269216307081184
24 Strasser F, Palmer JL, Willey J, et al. Impact of physician sitting versus standing during inpatient oncology consultations: patients' preference and perception of compassion and duration. A randomized controlled trial. *J Pain Symptom Manage* 2005;29:489-97. doi:10.1016/j.jpainsymman.2004.08.011
25 Johnson RL, Sadosty AT, Weaver AL, Goyal DG. To sit or not to sit?*Ann Emerg Med* 2008;51:188-93, 193.e1-2. doi:10.1016/j.annemergmed.2007.04.024
26 Swayden KJ, Anderson KK, Connelly LM, Moran JS, McMahon JK, Arnold PM. Effect of sitting vs. standing on perception of provider time at bedside: a pilot study. *Patient Educ Couns* 2012;86:166-71. doi:10.1016/j.pec.2011.05.024
27 Zenziper Straichman Y, Kurnik D, Matok I, et al. Prescriber response to computerized drug alerts for electronic prescriptions among hospitalized patients. *Int J Med Inform* 2017;107:70-5. doi:10.1016/j.ijmedinf.2017.08.008
28 Joglekar NN, Patel Y, Keller MS. Evaluation of Clinical Decision Support to Reduce Sedative-Hypnotic Prescribing in Older Adults. *Appl Clin Inform* 2021;12:436-44. doi:10.1055/s-0041-1730030
29 Centers for Medicare & Medicaid Services. The hospital value-based purchasing (VBP) program. 2021.
30 Siddiqui Z, Qayyum R, Bertram A, et al. Does Provider Self-Reporting of Etiquette Behaviors Improve Patient Experience? A Randomized Controlled Trial. *J Hosp Med* 2017;12:402-6. doi:10.12788/jhm.2744

Supplementary information: Additional figures 1-3, tables 1-5, and methods