



## Cohort Study

## Surgical patient satisfaction with a virtual hybrid care hotel model: A retrospective cohort study

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## ABSTRACT

**Introduction:** The Care Hotel is a virtual medicine hybrid model of care that was implemented at Mayo Clinic in Florida in July of 2020. This temporal accommodation offers patients a comfortable out of hospital environment where they can receive both in-person and virtual care after a surgery or procedure. This study aims to report patient feedback regarding their Care Hotel experience.

**Materials and methods:** Between July 23, 2020 and June 4, 2021, a satisfaction survey was sent to patients via email after their discharge from the Care Hotel. The survey consisted of 8 Likert questions rating their experience in the model as well as 2 questions where patients describe the positive and negative aspects of their stay. Patient demographics including age, sex, procedure performed, and the surgical/procedural service under which they were admitted to the hotel were also collected.

**Results:** Out of 182 patients admitted to Care Hotel, 102 answered the survey. Nine surveys were excluded due to missing patient information, and 93 surveys were analyzed. Eighty-seven percent of patients had a positive experience in the Care Hotel model and 94% of patients were likely to recommend the program to others. Positive comments highlighted the ease of use of the technology setups, the low cost of the hotel, the seamless transition of care, and the relief of the burden of care for family members.

**Conclusion:** The Mayo Clinic hybrid Care Hotel, combining both in-person and virtual modes of medical care, provides a good overall experience for patients following low-risk surgeries and procedures.

## 1. Introduction

Medicine is an ever-expanding field, with constant, transformation to better accommodate an evolving society. However, despite advances in healthcare processes and technologies, the model of admitting patients with inpatient stays to brick-and-mortar hospitals has remained unchanged. With momentum to both enhance recovery of patients after surgery as well as an effort to address hospital capacity in order to reduce overall medical costs, interest in changing this standard model of delivering patient care sparked the idea of the Care Hotel [1]. This patient hotel model is defined as a temporal, voluntary accommodation that offers patients a comfortable environment to receive restorative care before or after hospital treatment; however, this accommodation

must be connected to a stay or intervention in the hospital [2,3]. This model allows the patient to have increased contact with relatives, privacy, and a more normal physiologic state as compared to the confines of the hospital with the hopes of leading to better outcomes [2]. This model has been trialed in Europe and North America; however, literature on its outcomes remains scarce [2]. In 2015, Huzell et al. conducted a randomized clinical controlled trial comparing patient care at the hospital ward versus care at a hotel in breast cancer patients scheduled to undergo surgical management. With a response rate above 90% for both groups, this study found that the patients included in the care hotel had a better experience regarding privacy, the information given, staff availability, staff courtesy, and logistical coordination leading to an overall better patient experience [4]. This raises the possibility of the

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Care Hotel model as having the potential for improved patient satisfaction.

At Mayo Clinic in Florida, patients receiving low risk procedures or surgeries are often admitted overnight in an outpatient status to a hospital ward bed at the preference of their attending surgeon or proceduralist because these patients regularly travel a great distance to have the procedure, and “keeping a close eye on them for one night” is the personal preference of the surgical team. As hospital bed capacity was limited during the covid pandemic, we began to consider other modalities of patient care like Care Hotel. Due to limited nursing resources, we designed a new Care Hotel model that combined limited in-person daytime monitoring of past surgical and procedural patients with 24-h virtual telemonitoring in a hotel setting. We hypothesized that our new virtual hybrid Care Hotel program would be widely accepted by patients and provide a good overall experience. This study aims to report patient feedback regarding their care hotel experience and overall satisfaction.

## 2. Methods

### 2.1. Patients and setting

This study was approved by the Mayo Clinic Institutional Review Board as a retrospective chart review under protocol number 20–010753. This work is fully compliant with the STROCSS 2021 criteria [5]. This research is registered at Research Registry under identifying number: researchregistry7410. The study was conducted between July 23, 2020 and June 4, 2021 at Mayo Clinic in Florida, a 306-bed community academic hospital. Patients were included in the study if they had a one-night stay at the Care Hotel and completed the online experience survey. All patients gave both verbal and written consent to participate in the study. No further ethical review was deemed necessary by the Institutional Review Board. Patients were excluded if the survey was incomplete or had missing personal information that prevented patient record access. Patients qualified for Care Hotel if they had one of the approved inclusion procedures [Table 1].

### 2.2. Care hotel structure at the Mayo Clinic in Florida

The Care Hotel program was launched in July 2020 at Mayo Clinic in Florida at our on-campus hotel to care for patients undergoing low risk surgeries or procedures. Patients are referred to the Care Hotel by the primary surgical or interventional team prior to the procedure. At that time, the patient is educated about the capabilities of the program, including vital sign and nursing, neurologic assessments, dressing changes, urinary catheter and drain management and education, and breakthrough non-opioid pain and nausea medication administered by our paramedic team, as requested by the primary service. After this education, the patient is given the option to stay at the Care hotel; staying at Care Hotel is completely voluntary.

At the conclusion of their procedure, the patient must meet all discharge goals depending on their recovery pathway as well as their post-anesthesia discharge criteria. Once these criteria are met, the patient is transported to the hotel by the Mayo Clinic Paramedic team. Upon check-in to the hotel, patients are given a technology set including biometric devices for vital sign monitoring and a custom-configured tablet with video visit capability which is connected to the virtual medicine Command Center, located on the main Mayo Clinic in Florida campus. Here, physicians, registered nurses, and advanced practice providers work alongside non-clinical service coordinators to assist patients staying at the Care Hotel and communicate concerns to the primary team. The Care Hotel is physically staffed by one registered nurse from 7am until 7pm for vital sign assessment and dressing changes. The virtual registered nurse monitors the patient remotely from 7pm until 7am.

**Table 1**

Care hotel list of approved surgeries and procedures.

Care Hotel Surgeries and Procedure Population
ENT:
1. Parathyroidectomy.
2. Superficial parotidectomy
Gynecology and Urology:
1. Robotic or laparoscopic hysterectomy
2. Urethral sling placement
Urology
1. Implantable penile prosthesis
2. Artificial urinary sphincter placement
3. Holmium laser ablation of the prostate
4. Robotic prostatectomy/ureter resection procedures
Cardiology:
1. Electrophysiologic lab procedures including atrial fibrillation ablation, automatic implantable defibrillator and pacemaker placements
2. Cardiac catheterization lab procedures including patient foramen ovale closures and Watchman procedures
Breast and Plastic Surgery
1. Mastectomies with tissue expander placement
Neurosurgery:
1. Minimally invasive one level lumbar laminectomy
2. Minimally invasive one level lumbar discectomy
3. Minimally invasive one level lumbar fusion
4. Cervical disc replacement
5. Single level cervical discectomy and fusion
Neurologic interventional radiology:
1. Cerebral aneurysm coilings
2. Venous sinus embolizations
Pulmonary:
1. Post tracheal stent placement for tracheobronchomalacia.
Orthopedic surgery:
1. Total hip arthroplasty
2. Total knee arthroplasty.
GI/General Surgery
1. Endoscopic sleeves gastroplasty
2. Laparoscopic sleeve gastrectomy
3. Laparoscopic/robotic colectomy
4. Ileostomy reversal

### 2.3. Data measures

Post-hotel discharge, every patient was sent a satisfaction survey via email. The first and second sections of this online survey consisted of 8 questions asking patients to rate their level of agreement with specific details of the service as well as their experience with the Care Hotel on a 5-point Likert scale. The third section of the survey consists of two questions asking patients to write down what they liked or disliked from their stay at the Care Hotel [Table 2].

In addition to the survey answers, we collected the age, sex, procedure type, and the surgical service that was taking care of the patients. The number of answers per point in the Likert scale were counted and will be presented as a percentage of the total number of answers per survey question. Furthermore, areas of interest were extracted from the last two survey questions and will be further discussed. No statistical analysis was performed since the objective of the paper is to qualitatively present the gathered data.

## 3. Results

Between July 23, 2020 and June 4, 2021, 182 patients using the Care Hotel were sent an online survey and 102 answered it (response rate of 56%). Nine surveys were excluded due to either patient information missing or the survey being incomplete, so 93 surveys were analyzed. Fifty-five percent of patients were men and 45% were women. The average age was 60.2 years (standard deviation, 11.9 years). Of the patients that answered the survey, the service with the highest number

**Table 2**  
Survey questions.

Patient Survey Questions
<p>First section</p> <p>Please rate your level of agreement with the following statements:</p> <ol style="list-style-type: none"> <li>1. I felt comfortable spending a night at the Care Hotel.</li> <li>2. I felt safe being close to the hospital after my surgery/procedure.</li> <li>3. I understood how to use the phone or tablet if I needed to contact a care provider.</li> <li>4. The staff responded immediately when I called.</li> <li>5. My discharge instructions were explained in a way that was easy to understand.</li> <li>6. I felt like I was able to rest at the Care Hotel</li> </ol>
<p>Second section</p> <p>Based on your experience in the Care Hotel, please tell us how well we have met your needs:</p> <ol style="list-style-type: none"> <li>1. How well staff responded to your needs when transitioning from the Care Hotel to home.</li> <li>2. Likelihood of recommending this service to others.</li> </ol>
<p>Third section</p> <ol style="list-style-type: none"> <li>1. Please tell us about anything that impressed you about your experience with the Care Hotel program.</li> <li>2. Please tell us anything that disappointed you about your experience with the Care Hotel program.</li> </ol>

Patients answer questions in sections 1 and 2 with one of the following: (1) strongly agree or very good; (2) agree or good; (3) neither agree nor disagree or fair; (4) disagree or poor; (5) strongly disagree or very poor.

of postoperative patients treated at the Care Hotel was Neurosurgery (30 patients, 32% of the total), followed by Urology (22 patients, 24% of the total), and ENT (12 patients, 13% of the total). [Fig. 1].

Out of 558 answers from the first section of the survey, 487 (87%) were marked as “strongly agree” or “agree.” This corresponded with a positive experience in the Care Hotel. Out of 186 answers from the second section of the survey, 175 (94%) were marked as “very good” or “good.” This corresponded with patients both having a positive experience transitioning from the Care Hotel back to their primary residence as well as being highly likely to recommend the program to other patients [Fig. 2 and Fig. 3].

Comments were extracted from the third section of the survey. Positive comments complemented the technology provided to contact the surgical team during the hotel stay, the cost of the hotel room, and

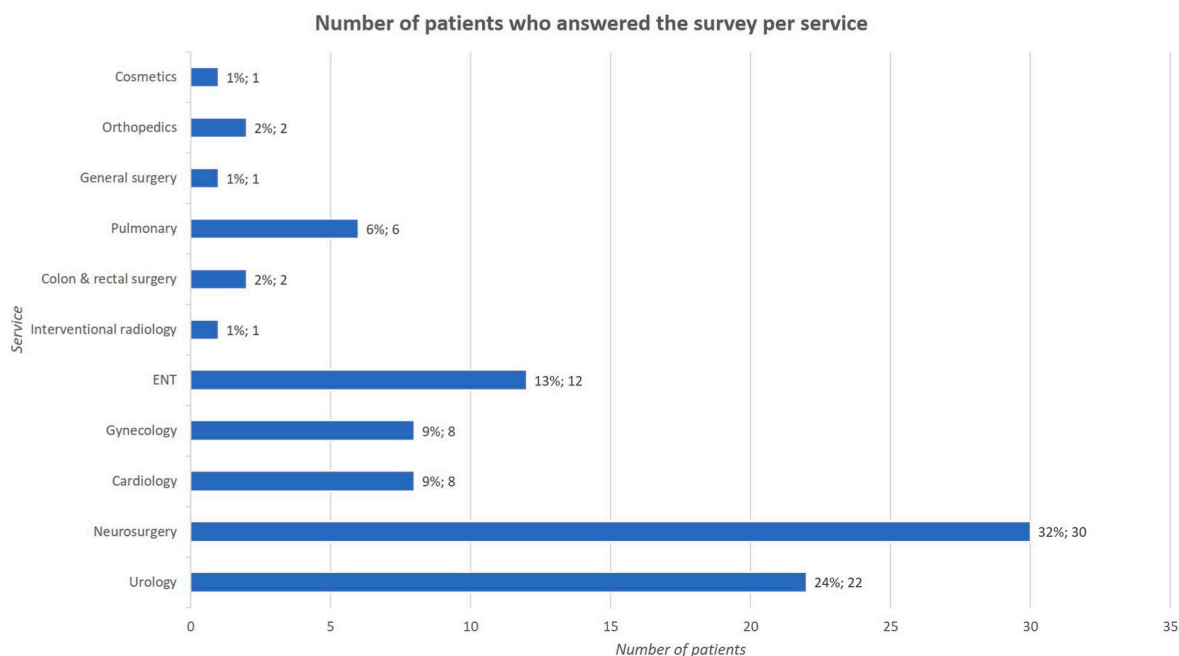
the seamless transition of care from the hospital to the hotel, among others. Negative comments revealed that room facilities were not adjusted for postoperative patients and several hindrances during the night shift [Table 3].

#### 4. Discussion

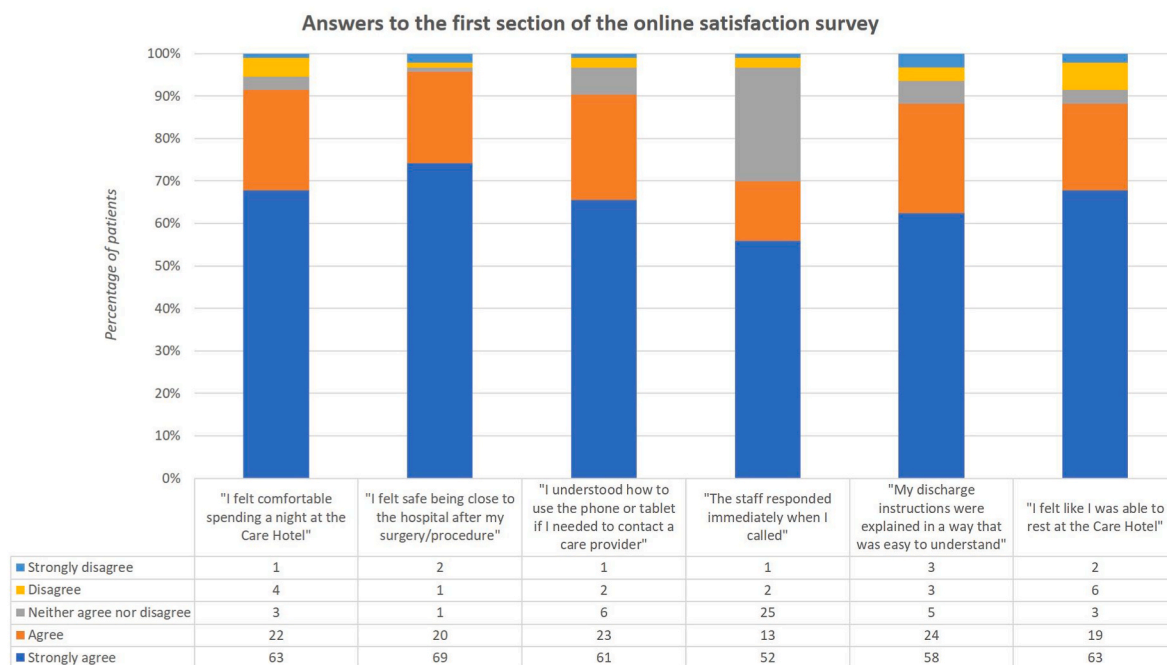
Our study showed that surgical patients receiving care in a hybrid Care Hotel model had an overall very positive experience. Eighty-seven percent of patients felt comfortable and safe, were able to rest, understood how to use the technology provided by the healthcare team, received prompt nursing attention when necessary, and had clear discharge instructions when leaving the hotel. Additionally, 94% of patients qualified the likelihood of recommending the care hotel to others as “good” or “very good”. These results are in alignment with previous patient experience results with Care Hotel models in Europe and North America [4,6], and further support the use of the hybrid Care Hotel model as surrogates for one-night inpatient admissions in this patient subgroup.

Positive comments observed in the third section of the survey, in which patients were able to describe in detail what they liked or disliked about the Care Hotel, underscored aspects of the experience that had not been previously considered in similar healthcare models. For example, the fact that staying at the Care Hotel released the family members of the burden of having to take care of the patients at home had previously only been observed in Care Hotels in which patients stayed by themselves without family members [7]. This can be the result of a mix of factors. Since one of the pivotal premises of the Care Hotel model is to promote patient independence, providing patients with a technology setup that allows them to constantly monitor their health status frees these family members of this responsibility. Furthermore, having the hospital’s main campus close to the hotel, reassuring patients and family member that if an emergency does occur that medical care is in close proximity, is another possible explanation for this positive response. In addition, being outside the confines of a hospital, which allows patients more freedom and control of all aspects of their daily routine, could also contribute the positive experience.

Analysis of the few negative comments also helped the practice



**Fig. 1.** Number of patients who answered the satisfaction survey per service. The number of patients per service, as well as the percentage of the total number of patients they represent, are presented in this figure.



**Fig. 2. Answers to the first section of the satisfaction survey.** Each column represents a question of the first section of the satisfaction survey. Each point in the Likert scale is color coded, and the times each point was chosen as an answer is presented as a percentage of the total number of answers per question in the column and as a whole number in the lower part of the figure. . (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)

realize what changes could be made to enhance the patients’ experience further. For example, we realized that the adjustment of room facilities for patients undergoing specific procedures is an aspect of this model that might be easily overlooked. One of the most common complaints was the absence of a recliner or a reclining hospital bed in the hotel room by patients who had undergone lumbar surgery. These postoperative patients found it uncomfortable to lie flat on a hotel bed, and therefore required more nursing assistance. From these comments we can conclude that optimizing hotel rooms for specific subgroups of patients might improve patient experience by enhancing comfortability and safety [8].

One of the strengths of this hybrid Care Hotel model is the combination of a daytime in-person registered nurse plus the physical availability of the paramedic staff with the virtual monitoring by both biometric devices as well as the virtual clinical team. This hybrid model was able to limit the need for multiple in-person staff at the Care Hotel, which reduces both personnel costs and travel fatigue. Interestingly, patients did sometimes report relative absence of on-site nursing personnel during the night shift as a dissatisfier. This indicates that although in may be cost effective and equally safe to use virtual nurse monitoring over the nighttime hours, patients who are used to an in-person observation may have trouble with the change management that accompanies this new model of care. Better preparation of patient expectations may help alleviate these worries. Furthermore, informing the patients of the ability and convenience to video interface with their surgical team in order to review the post-operative care plans, ask any care questions that were forgotten at the time of hospital discharge, and to engage the care team virtually for any urgent care needs (as opposed to just returning to the hospital Emergency Department) are all advantages of this virtual interface. We encourage other institutions to focus on how virtual visit technology can be used to engage postoperative patients after discharge.

**5. Limitations**

The most important limitation to this study is that, although the total

number of patients that have been treated at the Care Hotel is high, only 56% of patients answered the survey. Therefore, extrapolation of these data to the whole patient sample might not be entirely reliable and might pose a substantial bias. Furthermore, manual extraction of the demographic data might also account for small counting errors. Lastly, the subjective interpretation of the comments and results of the survey is also an inherent source of bias of these types of studies.

**6. Conclusion**

Mayo Clinic’s new hybrid Care Hotel was accepted by patients and provides a very good overall experience for patients following small and low-risk surgical procedures. This virtual hybrid model looks to contribute to rapid recovery post-procedurally as well as preserving hospital capacity. The economic impact both on the patient and the hospital is likely decreased since an overnight stay at the hotel is substantially cheaper than a hospital room. Continued patient feedback is of critical importance during the first years of this program and will allow us to identify improvement areas to eventually set this as a default program for patients undergoing specific procedures.

**Ethical approval**

This study was approved by our Institutional Review Board.

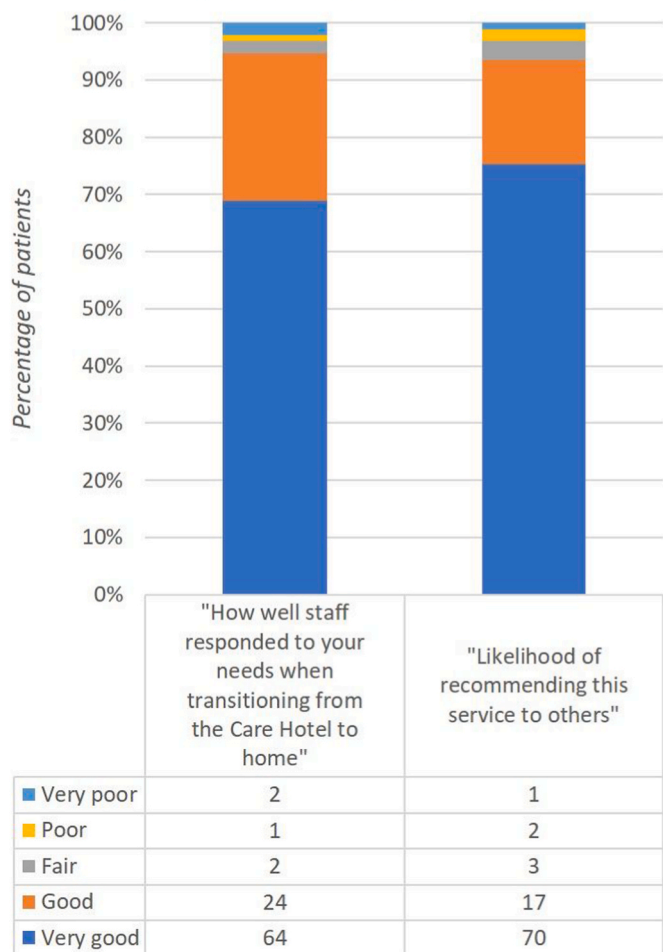
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**Author contribution**

Ryan M Chadha, M.D. – data collection, data analysis, writing, review. Margaret R. Paulson, D.O. – concept, design, review. Francisco R. Avila, MD – data collection, data analysis, writing. Ricardo A. Torres-Guzman, MD – data collection, data analysis, writing. Karla Maita, MD – data collection, data analysis, writing. John P. Garcia, MD – data

### Answers to the second section of the online satisfaction survey



**Fig. 3. Answers to the second section of the satisfaction survey.** Each column represents a question of the second section of the satisfaction survey. Each point in the Likert scale is color coded, and the times each point was chosen as an answer is presented as a percentage of the total number of answers per question in the column and as a whole number in the lower part of the figure. (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)

**Table 3**

Written survey feedback.

Areas of interest extracted from the last section of the survey	
Positive:	Negative:
1. Technology was easy to use.	1. Room facilities were not adjusted for postoperative patients.
2. Low cost of the hotel room compared to a hospital room.	2. Rough transition of care from the hospital to the hotel at night.
3. Seamless transition of care from the hospital to the hotel during the day.	3. Difficulty for reaching nursing personnel at night.
4. Family did not have to take care of the patient.	4. Poor discharge information at night.

collection, data analysis, writing. Antonio J. Forte, MD, PhD – data collection, data analysis, writing. Michael J. Maniaci, M.D – concept, design, data collection, data analysis, writing, review.

#### Registration of research studies

Name of the registry: Research Registry  
 Unique Identifying number or registration ID: researchregistry7410  
 Hyperlink to your specific registration (must be publicly accessible and will be checked): <https://www.researchregistry.com/register-now#home/registrationdetails/61a42b53b9c2ec001e68e479/>

#### Consent

Patients were consented when entering our program and research study.

#### Guarantor

Michael J. Maniaci, M.D.

#### Declaration of competing interest

None of the authors have any conflicts of interest to declare.

#### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.amsu.2022.103251>.

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