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ORIGINAL PAPER

# The Impact of Designated Behavioral Health Services on Resource Utilization and Quality of Care in Patients Requiring Constant Observation in a General Hospital Setting: A Quality Improvement Project

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**Abstract**
Constant observation (CO) is a common economic burden on general hospitals. A quality improvement (QI) project focusing on behavioral health (BH) management of this population was piloted using a novel BH protocol for the proactive assessment and management of all patients requiring CO. The impact on CO-cost and length of stay (LOS) was assessed. Data on demographics, diagnoses, psychopharmacologic treatment, complications and clinical setting were collected and analyzed for all CO-patients over a 6-month period. Cost and LOS data were compared with a similar sequential group prior to project implementation. Out of the 533 patients requiring CO during the study period, 491 underwent the protocol. This QI-project resulted in a significant reduction in the average monthly CO-cost by 33.06% and a 15% reduction in LOS without any increase in complications.

**Keywords** Constant observation · General hospital · Psychiatry consultation and liaison service · Hospital length of stay · One-to-one observation · Cognitive impairment

## Introduction

Constant observation (CO) is the allocation of hospital staff to observe specific patients to ensure safety. CO-utilization poses a challenge in general hospital settings by adding a substantial burden on hospital finances and personnel resources. CO-cost may range from $2 to 6 million per year, not including the cost of CO in specialized psychiatric units (Kathol et al. 2015). This is not surprising, considering that up-to 35% of patients requiring general medical admissions have behavioral health (BH) co-morbidity (Desan et al. 2011). High utilization of CO remains common despite multiple studies failing to demonstrate its efficacy in reducing falls or risk of self-harm (Harding 2010; Adams and Kaplow 2013).

Factors contributing to higher CO-cost include failure to reassess the need for CO on a regular basis (Rochefort et al. 2012) and lack of collaboration on CO-related decisions between hospital staff, patients and families (Torkelson and Dobal 1999). The involvement of BH services in the care of patients on CO in the general hospital has been recommended but its impact specifically on hospital cost savings hasn't been described (Lamdan et al. 1996).

Typically, patients with suicidal ideation, altered cognition and/or impaired judgment may require CO. There is a high prevalence of dementia and delirium in older hospitalized patients. Patients with cognitive impairment have a reduced threshold for sensory overload and distress which can lead to disruptive behaviors (Voss et al. 2017). By association, cognitive impairment may be a significant contributor to CO-utilization.

Aaron Pinkhasov and Deepan Singh are the two joint first authors contributed equally to the writing of this manuscript.

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Use of benzodiazepines, opiates and anticholinergic medications in patients with reduced cognitive reserve capacity is a commonly implicated factor in the development of delirium, which is a known driver of healthcare expenditure in elderly hospitalized patients (Inouye 2006). Prevention and early identification of patients at risk of delirium, falls and behavioral issues have been shown to be a more effective strategy for patient's safety than CO (Laws and Crawford 2013). Multi-modal non-pharmacologic interventions have demonstrated efficacy in the prevention of delirium (Siddiqi et al. 2016).

Based on the above evidence, the adoption of a multimodal non-pharmacologic approach in the management of patients requiring CO is warranted. Considering the impact and system-wide implications of CO on hospital resource management, a quality-improvement (QI) project focusing on the reduction of CO utilization was developed and implemented in a 591-bed hospital in the New York City metropolitan area. The goal of this project was to develop a protocol that would reduce CO utilization without leading to an increase in complications. In addition, its impact on CO-cost and length of stay (LOS) would be evaluated.

This QI project met SQUIRE 2.0 standards and was IRB exempt (Ogrinc et al. 2015).

## Methods

A comprehensive evaluation and management protocol was developed as part of this QI project (Fig. 1). To ensure early BH involvement, a hospital-wide process of referral and psychiatric assessment of all patients placed on CO within twenty-four regular business hours was formalized. All patients requiring CO had a CO-order placed by the primary medical-surgical team. CO could be ordered as one-to-one observation (1:1) or safety watch (SW). In 1:1, one staff member was made responsible for the direct observation of the patient and was required to stay within an arm's length of the patient at all times. In SW, one staff member could observe up-to four patients cohorted in the same room. The providers placing the initial CO order determined the type of observation. Both groups of CO patients were referred to and evaluated by the BH team consisting of a designated psychiatric nurse practitioner (NPP) working in close collaboration with a board-certified psychiatrist. Other than the NPP, no additional staff was hired for this project.

Any patient exhibiting suicidal or homicidal ideations was placed on 1:1 and an urgent psychiatry evaluation was provided. If the patient was found to be an imminent danger to self or others, 1:1 was continued and transfer to inpatient psychiatric setting was ensured once the patient was medically cleared.

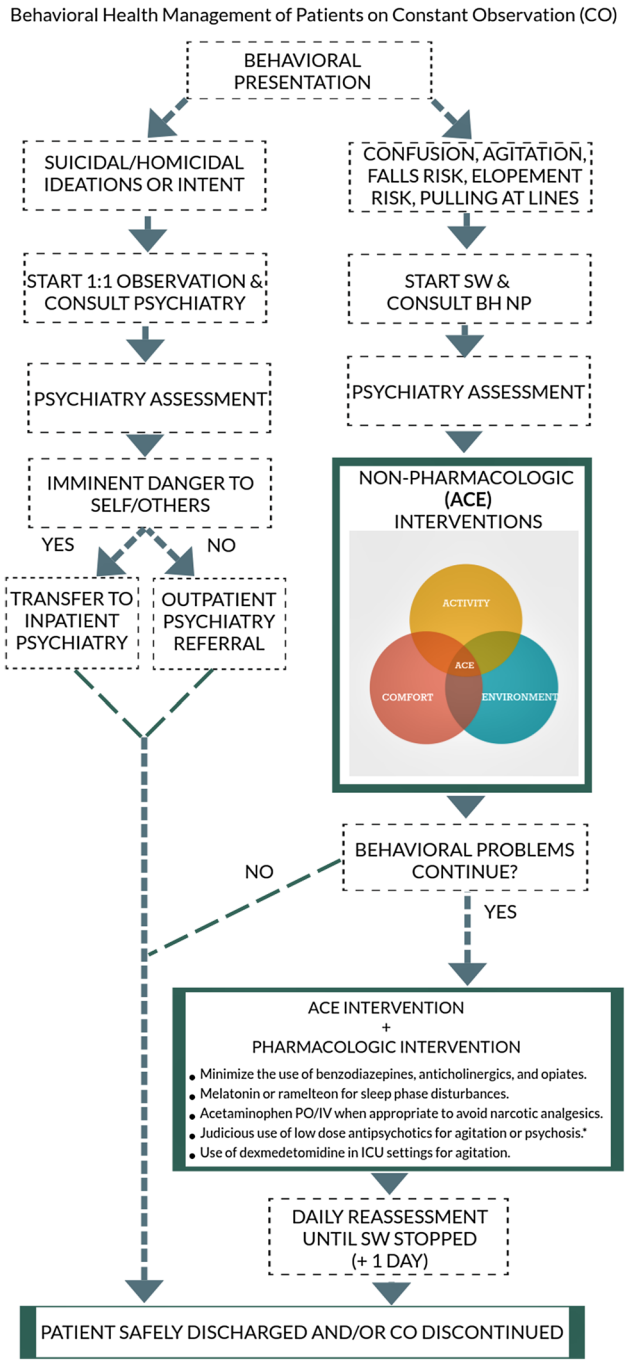


**Fig. 1** The evaluation and management of patients on constant observations (CO) followed a protocol that emphasized swift behavioral health assessment, preferentially using non-pharmacologic (ACE) interventions wherever appropriate (Fig. 2), and safe discontinuation of CO as soon as possible

Patients noted to be at risk due to agitation or confusion (pulling lines/catheters or at risk of elopement or falls) were placed on SW. A comprehensive initial psychiatric assessment with particular focus on cognitive assessment, medical co-morbidity, and current medication list was conducted

by the NPP. The assessment was preceded and followed by direct communication with the primary medical-surgical team. Using a semi-structured diagnostic interview based on the Diagnostic and Statistical Manual, 5th edition criteria, both groups of CO patients had a diagnostic impression and detailed treatment plan outlined. Whenever possible the family of the patient was contacted to get collateral information and to discuss recommendations.

Given the high rate of CO-utilization in patients at risk for delirium, multi-modal measures designed to prevent and reduce delirium in this population were routinely applied. An acronym for Activity, Comfort and Environment, "the ACE-intervention" was developed (Fig. 2). This intervention included education of hospital-staff, patients, and caregivers on delirium recognition and prevention. Frequent reorientation and redirection (e.g. encouraging the use of a call bell for assistance) were routinely recommended. Early ambulation and physical therapy were encouraged. Environmental recommendations included family presence, use of family photos, and familiar music. Whenever possible, patients were moved closer to nursing stations to improve access to staff. Sleep hygiene was emphasized by moving patient to beds next to windows, promoting daytime activity and by minimizing light and noise at night.

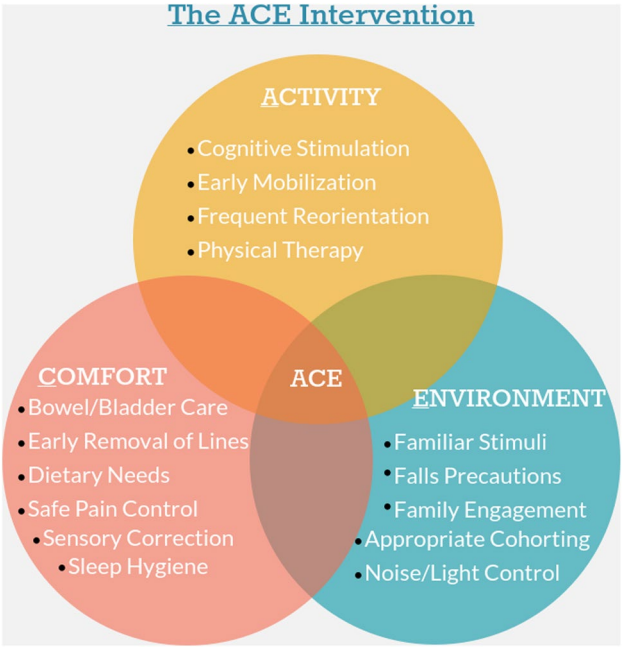


**Fig. 2** These non-pharmacologic interventions maximize patients' safety, stimulation, and support, minimizing the need for pharmacologic intervention, and reducing factors which often lead to the continuation of CO

When appropriate, early removal of lines/external tubes/Foley catheters, was recommended. Adequate pain management while minimizing and avoiding deliriogenic analgesics was recommended. Dietary needs and fluid intake were assessed to ensure adequate hydration and nutrition intake.

A careful review of current medication regimen and attempts to safely stop or taper the use of benzodiazepines, opiates, and anticholinergic medications (diphenhydramine, hydroxyzine, and scopolamine) were made. If the ACE-intervention was not enough to reduce behavioral disturbance, judicious use of psychotropic medications was employed (Table 1). Whenever necessary, the BH team served as a liaison between the family and healthcare team to assist with the efficient flow of care and appropriate discharge planning.

This protocol was implemented whenever a patient was placed on CO, daily thereafter as long as the patient remained on CO and at least 1 day after discontinuation. To ensure efficient use of BH resources, patients on SW for < 12 h or during weekends only were excluded from the protocol.

Data was collected over a 6-month study period to evaluate the effects of BH services on CO-utilization and related hospital metrics. This data included the reason for CO order, psychiatric diagnoses, utilized interventions, complications, LOS, and 30-day readmission rates.

Retrospective chart review was conducted on a sequential group of all patients placed on CO during a comparable 6-month interval in the previous year. This interval encompassed the same months in the previous year to account for the potential seasonal variation in general hospital patient flow. Besides the creation of two four-bedded rooms on the medical service to cohort patients on SW along with close oversight and data collection on staff utilization, no other hospital-wide program to reduce CO-utilization existed in the hospital prior to this QI project.

**Table 1** Low dose antipsychotic administration schedule

| Generic name | Usual dose range (mg/day) | Route | Extrapyramidal symptoms | QTc prolongation | Orthostatic hypotension |
|---|---|---|---|---|---|
| Haloperidol | 0.25–4 | PO/IM/IV | +++ | ++ (more with IV use) | + |
| Quetiapine | 12.5–100 | PO | +/− | +++ | +++ |
| Risperidone | 0.125–2 | PO, ODT | ++ | + | ++ |

Low dose antipsychotics were utilized only when non-pharmacologic measures were ineffective for agitation and/or psychosis. Please note that the FDA has issued a black box warning on the use of antipsychotics in elderly patients with dementia (1.7 times higher mortality compared to control groups) (Kuehn 2005)

## Statistical Analysis

Patient-specific data was collected on all patients admitted to the general hospital and placed on CO during the 6-month study period. Studied variables included age, gender, race/ethnicity, duration on CO, psychiatric diagnoses, use of psychotropic medications, hospital service, 30-day readmission rate, complications and LOS.

The CO cost was available in an aggregate format and was analyzed using individual-moving range (I-MR) control chart. LOS analysis was conducted using the Wilcoxon Rank Sum Test. A sensitivity analysis was conducted on LOS to account for multiple admissions among patients using a generalized linear model. Patients' demographic and clinical characteristics were compared using Kruskal–Wallis test with two-way comparisons when necessary and Pearson Chi square test with two-way comparisons adjusted by the Bonferroni method. Fisher's exact test was used to detect associations within psychopharmacologic interventions. Results with a p value $<0.05$ were considered significant. All analyses were done using SAS 9.4® and Minitab® 17.

## Results

During the 6-month study period, CO orders were placed on 533 patients. Patient demographics, diagnoses, psychopharmacologic treatment, complications and clinical setting data were collected on 491 patients that were seen by the BH team and underwent the protocol. The remaining 42 patients were excluded as CO was used for either $<12$ h or during weekends only.

### Demographics, Diagnoses and Clinical Setting (Table 2)

An association was noted between age and type of observation. Patients in the 1:1 group were younger than patients in the other group (adjusted p values $<0.001$). Patients in the 1:1 group were more likely to be seen in the emergency room (adjusted p value $\leq 0.017$), and SW was used less frequently in the ICU. On the general medicine-surgery floors, more patients were placed on SW vs. on 1:1. Significantly more patients with dementia or delirium were placed on SW than on 1:1. In contrast, the 1:1 group consisted of more patients with depression, psychosis, and alcohol or other substance abuse than the SW groups.

**Table 2** Demographics and diagnosis of patients on constant observation

| | One to one (1:1) | Safety watch (SW) | Total | p Value[a] |
|---|---|---|---|---|
| Number of participants | 279 | 212 | 491 | |
| Demographics | | | | |
| Age (years) | 61.3 ± 25.3 | 81.8 ± 12.8 | 70.2 ± 23.2 | <0.001 |
| Female (N, %) | 130 (46.6%) | 124 (58.5%) | 254 (51.7%) | 0.011 |
| White (N, %) | 225 (80.6%) | 183 (86.3%) | 408 (83.1%) | 0.114 |
| Hospital department | | | | |
| Emergency (N, %) | 63 (22.6%) | 3 (1.4%) | 66 (13.4%) | <0.001 |
| ICU (N, %) | 87 (31.2%) | 15 (7.1%) | 102 (20.8%) | <0.001 |
| Regular floor (N, %) | 182 (65.2%) | 202 (95.3%) | 384 (78.2%) | <0.001 |
| Diagnosis | | | | |
| Dementia (N, %) | 103 (36.9%) | 156 (73.6%) | 259 (52.7%) | <0.001 |
| Delirium (N, %) | 145 (52.0%) | 160 (75.5%) | 305 (62.1%) | <0.001 |
| Anxiety (N, %) | 34 (12.2%) | 18 (8.5%) | 52 (10.6%) | 0.236 |
| Depression (N, %) | 94 (33.7%) | 29 (13.7%) | 123 (25.1%) | <0.001 |
| Bipolar/mania (N, %) | 14 (5.0%) | 3 (1.4%) | 17 (3.5%) | 0.044 |
| Psychosis (N, %) | 22 (7.9%) | 2 (0.9%) | 24 (4.9%) | <0.001 |
| Alcohol use (N, %) | 30 (10.8%) | 9 (4.2%) | 39 (7.9%) | 0.011 |
| Other substance (N, %) | 16 (5.7%) | 0 (0.0%) | 16 (3.3%) | <0.001 |

Patients in the 1:1 group were significantly younger and the SW group had significantly more female patients. Patients in the 1:1 group were more likely to be seen in the emergency room, and SW was used less frequently in the ICU. On the regular medicine-surgery floors, more patients were in the SW group as compared to the 1:1 group

[a]Data were compared using Kruskal–Wallis test with pairwise comparisons using the Dwass, Steel, Critchlow–Fligner Method. All other variables were compared using Pearson Chi square test, with exact p values reported and pairwise comparisons adjusted by the Bonferroni method

## Constant Observation Costs

The MR portion of the I-MR control chart indicated that there were no out of control costs in the comparison period, indicating stability. Data collected during the study period was also noted to be stable. This indicates that the effects of the protocol during the study period can be accurately assessed and that the conclusions drawn are valid. The mean total cost of CO was $177,541 ± 35,570 in the comparison period vs. a mean total cost of $118,847 ± 16,961 in the study period. This indicates a significant reduction in the average monthly cost of $58,700 or 33.06% (p value 0.045) with projected annual savings of over $700,000 at our institution.

## Length of Stay

Median LOS in 2014 was 7 days with an interquartile range of 4–13 days. In comparison, the median LOS for 2015 was 6 days with an interquartile range of 3–13 days. This 1-day reduction translates to a 15% reduction in LOS based on first admission data (see Table 3). This finding remained significant with 14.1% reduction even after readmissions were taken into account. The sensitivity analysis confirmed these results.

## Complications

Patient-level data points were unavailable for the comparison period, preventing direct statistical analysis of complications. When looking at this raw data, there were 63 falls in the comparison period vs. 2 falls in the study period. There were ten inadvertent extubations in the comparison period vs. 0 inadvertent extubations in the study period. There were three elopements during the comparison period vs. one during the study period. In the control period, there were 20 of 553 patients (3.6%) readmitted within 30 days vs. 10 of 491 patients (2.0%) readmitted within 30 days during the study period. When comparing only the raw data, the difference in readmission rate was not significantly different (p value = 0.141).

## Medication Treatment

Medication reduction and discontinuation data during the intervention period is as follows: 130 patients (26.8%) were on benzodiazepines. Of these 130 patients, benzodiazepines were reduced in 32 (24.6%) and discontinued in 69 (53.1%). No change in benzodiazepine use was made in the remaining 29 (22.3%) patients. 116 patients (23.9%) were on opiates. Of these 130 patients, opiates were reduced in 39 patients (33.6%) and discontinued in 57 (49.1%) patients. No change in opiate use was made in the remaining 20 patients (17.2%). 12 patients (2.5%) were on anticholinergic medications, specifically diphenhydramine, hydroxyzine, or scopolamine, which were targeted in this study due to their high deliriogenic risk. Anticholinergics were discontinued in 11 patients (91.7%). The remaining one patient (8.3%) had no change in anticholinergic medication.

There was an association between the type of psychopharmacologic intervention and type of observation provided (Table 3). Patients on 1:1 observation were significantly less likely to be treated with antidepressants or dementia medications. Furthermore, significantly fewer patients on 1:1 observation were treated with melatonin agonists. Compared to patients on SW, the 1:1 group was more likely to be treated

**Table 3** Psychopharmacologic treatment of patients on constant observation

| Treatment | One to one | Safety watch | Total | p Value |
|---|---|---|---|---|
| Typical antipsychotics (N, %) | 92 (33.0%) | 63 (29.7%) | 155 (31.6%) | 0.493 |
| Atypical antipsychotics (N, %) | 96 (34.4%) | 82 (38.7%) | 178 (36.3%) | 0.344 |
| Antidepressants (N, %) | 67 (24.0%) | 69 (32.5%) | 136 (27.7%) | 0.042 |
| Melatonin agonists (N, %) | 77 (27.6%) | 115 (54.2%) | 192 (39.1%) | < 0.001 |
| Benzodiazepines (N, %) | 47 (16.8%) | 19 (9.0%) | 66 (13.4%) | 0.011 |
| Mood stabilizers/anticonvulsant (N, %) | 53 (19.0%) | 23 (10.8%) | 76 (15.5%) | 0.016 |
| Dementia medications (N, %) | 25 (9.0%) | 46 (21.7%) | 71 (14.5%) | < 0.001 |
| PRN utilized (N, %) | 48 (17.2%) | 36 (17.0%) | 84 (17.1%) | 0.999 |
| PRN typical antipsychotics (N, %) | 34 (12.2%) | 21 (9.9%) | 55 (11.2%) | 0.472 |
| PRN atypical antipsychotics (N, %) | 11 (3.9%) | 10 (4.7%) | 21 (4.3%) | 0.823 |
| PRN benzodiazepines (N, %) | 13 (4.7%) | 9 (4.2%) | 22 (4.5%) | 0.999 |
| PRNs not ordered by psych (N, %) | 11 (3.9%) | 6 (2.8%) | 17 (3.5%) | 0.621 |
| PRN utilized (N, %) | 48 (17.2%) | 36 (17.0%) | 84 (17.1%) | 0.999 |

A review of all psychopharmacologic treatment administered during the study period in the one to one and safety watch groups. All variables were compared using Pearson Chi square test, with exact p values reported and pairwise comparisons adjusted by the Bonferroni method

with benzodiazepines (adjusted p value = 0.005). All variables were compared using Pearson Chi square test, with exact p values reported and pairwise comparisons adjusted by the Bonferroni method.

This QI project met SQUIRE 2.0 standards and was IRB exempt (Ogrinc et al. 2015).

## Discussion

Recent changes in the healthcare landscape call for a significant focus on integrated BH. There is a growing body of evidence indicating this approach improves outcomes while being cost-effective (Cruze 2015).

While the current emphasis on integration mostly goes to the outpatient primary care setting, the use of CO in the general hospital setting deserves closer observation. The goal of this QI project was to evaluate the effect of timely integration of a dedicated BH team on the utilization of CO resources in a general hospital setting. We examined the impact of proactive assessment and collaborative management of patients on CO by the BH team on the cost of CO, LOS, 30-day readmission rate, and the incidence of complications (falls, elopements or inadvertent extubations).

This project had a significant positive economic impact on our institution. It led to savings of over 33% in total CO-cost along with a 15% reduction in LOS in the CO population. This impact is substantially larger than the costs incurred in hiring an NPP. The 6-month cost including the salary and benefits of a psychiatric NP in the US is $38,278–$69,694 at the time of this writing (PayScale, Inc. 2017).

In this study population, there was a high prevalence of delirium (62.1%) and dementia (52.7%). The high prevalence of delirium and reduction of potentially deliriogenic medications may partly explain the demonstrated positive impact of this project.

There were important correlations noted between the type of observation and pharmacological intervention. Compared to the 1:1 group, use of benzodiazepines was significantly lower in the SW group, reflecting efforts to minimize the risk of delirium in this vulnerable patient population. Patients requiring 1:1 observation were significantly younger, more likely to present in the emergency room, and more likely to have depression, psychosis, and/or substance use disorders. The more frequent benzodiazepine use in this group is likely due to their younger age and higher prevalence of substance use and withdrawal.

The SW group utilized significantly more CO days compared to the 1:1 group. This may be due to the high prevalence of dementia and/or delirium coupled with inherently more complex medical co-morbidity and frequent need for discharge to settings such as subacute rehabilitation or skilled nursing facility.

In this study, patients with delirium and dementia that started off on 1:1 were more likely to have CO discontinued or changed to SW allowing cohorting when possible. Early detection and management of cognitive deficits and delirium in elderly patients was essential in the reduction of CO use. The results underline the utility of proactive screening and management of dementia and delirium in patients above age sixty-five.

In the study period, critical care units utilized more 1:1 than SW. This may be explained by concerns about self-extubation or removal of lines/catheters.

This study has several limitations. While a correlation was found between demographics and diagnoses with the type of CO observation, the correlation between age, diagnoses, complications and 30-day readmissions was not statistically analyzed. Due to the vague nature of documented reasons for CO initiation, we could not pursue analysis thereof. Future studies and similar protocols might benefit from the improved delineation of reasons for CO. For logistical reasons, the protocol wasn't implemented over weekends and holidays. Feasibility of protocol implementation during weekends and holidays should be evaluated as it may demonstrate additional benefits. Timing patterns of PRN medication administration were not assessed. Assessment of such patterns in future studies may provide further insight into worsening behaviors such as the "sundowning" phenomenon (Khachiyants et al. 2011). An important part of the protocol was the early identification of patients in need of acute inpatient psychiatric hospitalization. This may have led to expedited transfers, resulting in more appropriate care while preserving hospital resources. However, since the comparison period in this study did not have data available for patients transferred to inpatient psychiatric units, the impact of expedited transfers cannot be quantified. Of note, the hospital did not have a designated psychiatric emergency room and/or specialized psychiatric unit. Ideally, having an inpatient psychiatric and a med-psych integrated unit in the hospital would further improve the quality and flow of specialized care.

Although multiple variables were looked at during the study period, only CO-cost, LOS, 30-day readmissions and complications were available for the comparison group. The statistical significance of the above-noted reduction in complications cannot be commented on due to lack of individual-level data. Random case–control assignment in future studies may demonstrate that the true economic impact of such an intervention may be higher due to the associated reduction in 30-day readmission rate, falls, and extubations. Although the ACE-intervention measures were routinely recommended for patients on CO and most likely had an impact on the overall results, this study did not look at the correlation of individual components of this intervention with the reduction in CO-utilization. Since delirium

incidence data was not available from the comparison group, future studies may be necessary to examine the effect of similar intervention programs on reducing delirium in the CO population. Finally, this study did not examine the effect of the protocol on patient and staff experience and satisfaction. The development of guidelines for the training of CO personnel in regards to the active engagement of this patient population may show improved health outcomes, including cognitive and physical function.

Institutional buy-in, along with excellent collaboration and support from the administration and nursing, was crucial in the successful implementation of the program. The education of staff, patients, and their families, as well as consistent communication with all involved team members, was an important part of the ACE-intervention. This increased the acceptance of early involvement and the recommendations of the BH team by hospital staff.

## Conclusion

Early, proactive, and consistent involvement of a designated BH team in the management of general hospital patients requiring CO demonstrated significant improvement in hospital economics and quality of care. This study proposes a protocol and specific non-pharmacologic measures (the ACE-intervention) that may be implemented by general hospitals to reduce CO-utilization and improve health care delivery.

### Compliance with Ethical Standards

**Conflict of interest** The authors declare that they have no conflict of interest.

**Research Involving Human Participants and/or Animals** This article does not contain any studies with animals performed by any of the authors. This quality improvement (QI) project met SQUIRE 2.0 standards and was IRB exempt (Ogrinc et al. 2015).

**Informed Consent** Informed consent was not required to be obtained from any individual participants included in the study as it med SQUIRE 2.0 guidelines for a quality improvement study (Ogrinc et al. 2015). No identifying information about participants is available in the article.

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