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Association Between Opening a Palliative Care Unit and Hospital Care for Patients with Serious Illness

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Abstract

Background: Palliative care units (PCUs) are devoted to intensive management of symptoms and other palliative care needs. We examined the association between opening a PCU and acute care processes at a single U.S. academic medical center.

Methods: We retrospectively compared acute care processes for seriously ill patients admitted before and after the opening of a PCU at a single academic medical center. Outcomes included rates of change in code status to do-not-resuscitate (DNR) and comfort measures only (CMO) status, and time to DNR and CMO. We calculated unadjusted and adjusted rates and used logistic regression to assess interaction between care period and palliative care consultation.

Results: There were 16,611 patients in the pre-PCU period and 18,305 patients in the post-PCU period. The post-PCU cohort was slightly older, with a higher Charlson index ($p < 0.001$ for both). Post-PCU, unadjusted rates of DNR and CMO increased from 16.4% to 18.3% ($p < 0.001$) and 9.3% to 11.5% ($p < 0.001$), respectively. Post-PCU, median time to DNR was unchanged (0 days), and time to CMO decreased from 6 to 5 days. The adjusted odds ratio was 1.08 ($p = 0.01$) for DNR and 1.19 ($p < 0.001$) for CMO. Significant interaction between care period and palliative care consultation for DNR ($p = 0.04$) and CMO ($p = 0.01$) suggests an important role for palliative care engagement.

Conclusions: The opening of a PCU at a single center was associated with increased rates of DNR and CMO status for seriously ill patients.

Keywords: end-of-life care; inpatient palliative care unit; spillover effects

Introduction

PALLIATIVE CARE TEAMS have been found to provide high-value service to patients, families, and health care institutions.¹⁻⁴ Multiple models are utilized to deliver palliative care services, including outpatient clinics, inpatient consultative services, and inpatient palliative care units (PCUs). As with

other models, PCUs have been found to decrease the cost of care and length of stay compared to usual care,⁵⁻⁷ and are viewed favorably by patients and families.⁸ Most studies of PCUs have focused on structural description, and the impact of PCUs on utilization and financial outcomes for patients admitted to them.

Despite the growing evidence that palliative care affects the patients receiving it, there is much less information about how

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palliative care may cause changes in the care of patients within an institution more broadly, including that of “nonpalliative care” patients. The opening of a PCU at our institution provided a unique opportunity to examine the care of all seriously ill patients at the institution before and after PCU opening.

We hypothesized that the availability and visibility of a dedicated unit for end-of-life care at an institution may change provider behaviors across that institution. For example, the presence of a dedicated care pathway for end of life (the PCU) may prompt discussion of goals of care of patients who are approaching end of life. This visibility may also increase the uptake of palliative care more generally for all seriously ill patients. We hypothesize that opening of a PCU will increase care processes associated with patient-centered goals of care communication, including the frequency and timeliness of “Do-Not-Resuscitate” (DNR) and comfort measures only (CMO) orders in both PCU-eligible and non-PCU-eligible patients.

Methods

Approach

We conducted a retrospective analysis of seriously ill patients before and after the opening of a PCU. We sought to assess changes in clinical practice that might be affected by the opening of the PCU, including length of hospital stay and place of death, and in patient-centered communication around goals of care. DNR orders have been found to be more likely in patients with palliative care consultations and who receive communication interventions.⁹ Discussion of goals of care and prognosis are an obligate part of transition to CMO status. As both DNR and CMO orders are easily obtained administratively, we chose to use these as surrogate measures for processes of care in the institution relating to identification of goals of care.

Setting

Dartmouth Hitchcock Medical Center (DHMC) is a 450-bed academic tertiary care medical center in New Hampshire that serves as the primary advanced care institution for ~1.5 million people. The palliative care service at DHMC was established in 2000 and is well embedded in the institution. The interdisciplinary team includes 13 physicians, 3 nurse practitioners, 2 nurse coordinators, 3 social workers, 2 chaplains, 1 healing arts practitioner, and 2 volunteer coordinators. Outpatient services include a free-standing outpatient clinic as well as embedded palliative care in the Dartmouth Cancer Center. Inpatient services include a consultative service, a dedicated intensive care unit (ICU) service utilizing trigger criteria to identify patients for consultation, and a PCU.

DHMC opened their PCU, the Jack Byrne Center for Palliative & Hospice Care (JBC), on December 18, 2017. The JBC is a freestanding center on the same campus as the main hospital, containing 12 acute care beds, of which 8 are staffed full time. Administratively the JBC is an inpatient unit of the hospital; thus, there is no distinction between insurance billing or quality metrics for patients admitted, who are not enrolled in hospice.

There is an interdisciplinary palliative care team (nurse, clinician [physician or advance practice nurse practitioner], social worker, chaplain, healing arts providers, and volunteer

coordinator) and 24/7 palliative care clinician coverage from the institution’s palliative care team. Admission criteria include election of care focused on comfort and quality of life and/or enrollment in a community hospice program, DNR code status, and care needs that require inpatient stay such as poorly controlled pain, or respiratory support. Approximately 80% of admissions to the JBC are transfers from the main building of the hospital, with the remainder of admissions coming from the community setting primarily referred from hospice agencies for general inpatient or respite admission. Approximately 80% of patients admitted to the JBC die before discharge; the remainder are discharged to home (typically with hospice) or another health care facility.

Participants and data sources

All data for seriously ill patients admitted to DHMC and the JBC from 2016 to 2019 were obtained from the DHMC Analytics Institute. We captured demographic and clinical characteristics from the electronic medical record (EMR; Epic, Verona, WI). We defined patients with serious illness as those with a Charlson comorbidity index (CCI) score of 3 or more; the CCI is well validated as a measure of comorbidity burden and is widely used to identify seriously ill patients.^{10,11} We classified patients admitted between January 1, 2016, and December 17, 2017 (two years before the opening of the PCU), as being in the “pre-PCU” period and those admitted between December 18, 2017, and December 31, 2019 (two years after the opening of the PCU), as being in the “post-PCU” period.

Covariates

Demographic information extracted from the EMR included age, gender, median household income, and payer source. Clinical measures included reason for admission, CCI, admission source, and admitting service.

Health care utilization and administrative outcomes

Our primary outcomes were change in code status to DNR, change to CMO status, and time to DNR and CMO orders. Secondary outcomes were disposition from the hospital, palliative care consultation, and mean hospital length of stay. All utilization measures were obtained from the EMR for the patients in our cohort.

Analyses

We assessed differences in baseline patient characteristics between the pre- and post-PCU period among seriously ill patients using chi-square tests for categorical variables (i.e., admitting service) and *t* tests for continuous variables (i.e., CCI); balance was assumed using a significance level of 0.05.

We calculated unadjusted rates of our primary and secondary outcomes among all seriously ill patients using chi-square tests for categorical variables (i.e., sex) and *t* tests for continuous variables (i.e., age). We conducted time to event analysis for both DNR and CMO orders, censoring for death and discharge. We calculated the mean days to DNR and CMO for patients with those orders. Survival curves were generated for all patients with serious illness, and we restricted the analysis to the first 50 days after admission, to capture 99% of patients.

For each of the dichotomous outcomes, we estimated logistic regression models, adjusting for age, sex, and CCI, and accounted for correlation between time periods (yearly quarters) with an independent covariate structure. We calculated odds ratios (ORs) by care period (model 1). We then repeated the adjusted analyses, with the addition of palliative care consultation to the model as a predictor, and calculated the ORs for DNR and CMO by care period and palliative care consultation (model 2).

Conceptually, one can view a referral for palliative care consult either as a secondary outcome or as an intermediate step for the patient-provider team in determining transfer to the PCU. For this reason, we consider both approaches; the first by including a consult as an outcome, and for the second approach by including an interaction between care period and palliative care in the logistic regression models to assess whether the palliative care consult is associated with higher rates of DNR and CMO (model 3).

The Institutional Review Board of Dartmouth Hitchcock approved this study, waiving consent and authorization per 45 Code of Federal Regulations 46.116(d) and 45 Code of Federal Regulations 164.512(1) (2)(ii), respectively.

Results

Our cohort contained a total of 34,916 patients, 16,611 in the pre-PCU period and 18,305 in the post-PCU period

(Table 1). The post-PCU cohort was slightly older, 64.8 years compared to 64.1 years in the pre-PCU cohort ($p < 0.0001$), and with an average CCI of 5.1 in the post-PCU period compared to 4.8 in the pre-PCU period ($p < 0.0001$). The post-PCU cohort included fewer women, and fewer Medicare patients than the pre-PCU cohort. Patients in the post-PCU cohort were less likely to be admitted to critical care, general surgery, or neurology, and more likely to be admitted to hematology/oncology, obstetrics/gynecology, and surgical subspecialties ($p < 0.0001$).

Unadjusted analyses

Changes in code status to DNR during admission increased from the pre-JBC to the post-JBC period, from 16.4% to 18.3% ($p < 0.001$), an increase of approximately six patients per week. Likewise, the fraction of CMO orders during admission increased in the post-JBC period, from 9.3% to 11.5% ($p < 0.001$), an increase of approximately five patients made CMO per week of the study period.

More patients in the post-PCU period died in the hospital (from 921 [5.5%] in the pre-PCU to 1209 [6.6%] in the post-PCU, $p < 0.001$); of those who died in the hospital in the post-PCU period, 612 (3.3% of total) died in the PCU. Fewer patients were discharged home with hospice (from 1.2% in the pre-PCU to 1.0% in the post-PCU $p < 0.001$). The rate of palliative care consultations increased from 7.9% of

TABLE 1. DEMOGRAPHIC AND CLINICAL CHARACTERISTICS OF THE TWO COHORTS: IN THE PRE-PERIOD AND POST-PERIOD, WITH *P*-VALUES ASSESSING CHANGES BETWEEN PERIODS

| | <i>Seriously ill</i> | | <i>p</i> |
|---|----------------------------|-----------------------------|----------|
| | <i>Pre-PCU, N = 16,611</i> | <i>Post-PCU, N = 18,305</i> | |
| Age, years, mean (95% CI) | 64.1 (63.9–64.4) | 64.8 (64.6–65.1) | <0.0001 |
| Female sex, <i>n</i> (%) | 7491 (45.1) | 7999 (43.7) | 0.01 |
| Median household income, \$ (95% CI) | 62,727 (62,352–63,102) | 62,796 (62,431–63,162) | 0.8 |
| Charlson comorbidity index, mean (95% CI) | 4.8 (4.8–4.9) | 5.1 (5.1–5.2) | <0.0001 |
| Payer source | | | |
| Medicaid | 1526 (9.2) | 1729 (9.5) | <0.0001 |
| Medicare | 9799 (59.1) | 9961 (54.5) | |
| Self | 118 (0.7) | 168 (0.9) | |
| Other | 5146 (31.0) | 6416 (35.1) | |
| Admitting service, <i>n</i> (%) | | | |
| Cardiology | 4646 (25.5) | 4218 (25.5) | <0.0001 |
| Critical care | 1865 (11.2) | 1523 (8.3) | |
| Emergency medicine | 59 (0.3) | 49 (0.3) | |
| General surgery | 1704 (9.3) | 1353 (8.2) | |
| Hematology/oncology | 844 (4.6) | 965 (5.8) | |
| Hospital medicine | 5367 (29.4) | 4919 (29.7) | |
| Neurology | 1740 (9.5) | 1474 (8.9) | |
| Obstetrics/gynecology | 345 (1.9) | 360 (2.2) | |
| Orthopedic surgery | 478 (2.6) | 398 (2.4) | |
| Pediatrics | 237 (1.3) | 238 (1.4) | |
| Surgical subspecialties | 878 (4.8) | 1032 (6.2) | |
| Other ^a | 135 (0.8) | 89 (0.5) | |
| Admission source, <i>n</i> (%) | | | |
| Outpatient setting/clinic | 2545 (15.3) | 2646 (14.5) | <0.0001 |
| Transfer from another hospital | 6391 (38.5) | 6792 (37.1) | |
| Nonhealth care facility | 6917 (41.6) | 8002 (43.7) | |

^aOther: Medical specialties, pain clinic, palliative care, radiology, missing. CI, confidence interval; PCU, palliative care unit.

TABLE 2. ACUTE CARE PROCESSES AND OUTCOMES OF SERIOUSLY ILL PATIENTS IN THE PRE-PERIOD AND POST-PERIOD, BY CARE PERIOD

| | Pre-PCU (n=16,611) | Post-PCU (n=18,305) | p |
|--|--------------------|---------------------|--------|
| Code status to DNR during admission, n (%) | 2720 (16.4) | 3350 (18.3) | <0.001 |
| CMO during admission, n (%) | 1542 (9.3) | 2100 (11.5) | <0.001 |
| Disposition from hospital, n (%) | | | |
| Death during admission | 921 (5.5) | 1209 (6.6) | <0.001 |
| Death in main hospital | 921 (5.5) | 597 (3.3) | <0.001 |
| Death in PCU | 0 | 612 (3.3) | — |
| Home with hospice | 191 (1.2) | 182 (1.0) | <0.001 |
| Hospice facility | 20 (0.1) | 36 (0.2) | <0.001 |
| Palliative care consultation, n (%) | 1313 (7.9) | 1826 (10.0) | <0.001 |
| Hospital LOS, days, mean (95% CI) | 7.04 (6.9–7.2) | 7.58 (7.4–7.7) | <0.001 |

CMO, comfort measures only; DNR, do-not-resuscitate; LOS, length of stay.

admissions in the pre-PCU period to 10.0% ($p < 0.001$), and the mean length of stay increased from 7.04 to 7.58 days ($p < 0.001$) (Table 2).

In time to event analyses, the time to DNR and time to CMO were shorter in the post-PCU period (p -value < 0.0001 , and 0.02 , respectively) (Fig. 1). In the post-PCU period, the mean days to DNR was 0 days (unchanged), and mean time to CMO was 5 days in the post-PCU period compared to 6 days in the pre-PCU period.

Adjusted analyses

In our adjusted model 1, the OR for DNR in the post-PCU period compared to the pre-PCU period was 1.08 ($p = 0.01$),

and the OR for CMO in the post-PCU period compared to the pre-PCU period was 1.19 ($p < 0.001$) (Table 3). In adjusted model 2, the OR for patients who received palliative care consults versus those who did not was 9.71 ($p < 0.001$) for DNR, and the OR of CMO for those who received palliative care consults versus those who did not was 13.81 ($p < 0.001$).

In adjusted model 3, the association between palliative care consultation and both DNR and CMO was larger in the post-PCU period, with p -values 0.04 and 0.01, respectively. The main effect of care period was no longer statistically significant for either (p -values 0.99 and 0.5, respectively), suggesting that the increase in palliative care consultation in the post-PCU period was a primary influence in the changes seen in outcomes (Table 3).

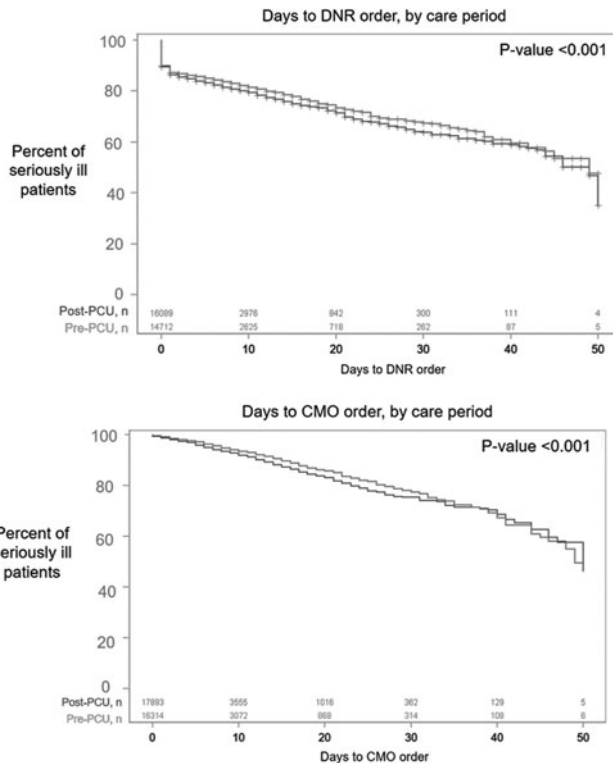


FIG. 1. Time to event curves for time to DNR (with censoring at death or discharge) and time to CMO (with censoring at death or discharge), by period. CMO, comfort measures only; DNR, do-not-resuscitate.

Discussion

We found that the opening of an inpatient PCU was associated with an increase in institutional rates of patients with serious illness changing their code status to DNR, increased rates of transitioning to a comfort-oriented approach to care, and a shorter time between admission and changing to DNR and CMO. We also found increased rates of palliative care consultation after the PCU opening. Analysis of the interaction effect between pre- and post-PCU opening and palliative care consultation demonstrated that patients who were seen by the palliative care consultation service were more likely to be made DNR and CMO in the post-PCU period than in the pre-PCU period. This is the first work to find such an indirect effect from the opening of a PCU to impact the care of patients elsewhere in a health care institution.

There has been limited investigation into the impact of opening a PCU on clinical outcomes for patients admitted to the unit itself. Previous studies have demonstrated that patients admitted to a PCU were rated to have a higher quality of dying, more goals of care discussions and more likely to be DNR, and a shorter length of stay than those admitted to the institution and managed by a palliative care service.^{12–14}

Multiple studies have shown that opening a PCU results in a change in location of death, with patients more likely to die in the PCU than elsewhere in the institution.^{7,15,16} It is well described in the literature that palliative care in the hospital reduces overall costs for the patients who are seen,¹⁷ and PCUs themselves are likewise associated with reduced costs of care.^{5,6,18–21} May et al. found that PCUs are associated

TABLE 3. ODDS RATIOS FOR DO-NOT-RESUSCITATE AND COMFORT MEASURES ONLY, ADJUSTING FOR AGE, SEX, AND COMORBIDITY

| Model ^a | Outcomes (OR) in the post-PCU period compared to pre-PCU | | | |
|--|--|--------|-------|--------|
| | DNR | p | CMO | p |
| 1. Care period alone | | | | |
| Care period | 1.08 | 0.01 | 1.19 | 0.00 |
| 2. Care period+palliative care | | | | |
| Care period | 1.04 | 0.37 | 1.12 | 0.04 |
| Palliative care consult | 9.71 | <0.001 | 13.81 | <0.001 |
| 3. Care period+PC+interaction | | | | |
| Care period | 1 | 0.99 | 0.95 | 0.5 |
| Palliative care consult | 8.5 | <0.001 | 11.03 | <0.001 |
| Care period×palliative care consult (interaction term) | 1.2 | 0.04 | 1.48 | 0.01 |

^aModel 1: $y=b_0 + b_1 \times \text{Care} + b_2 \times \text{sex} + b_3 \times \text{age} + b_4 \times \text{charlson}$; Model 2: $y=b_0 + b_1 \times \text{Care} + b_2 \times \text{PC} + b_3 \times \text{sex} + b_4 \times \text{age} + b_5 \times \text{charlson}$; Model 3: $y=b_0 + b_1 \times \text{Care} + b_2 \times \text{PC} + b_3 \times \text{Care} \times \text{PC} + b_4 \times \text{sex} + b_5 \times \text{age} + b_6 \times \text{charlson}$.
OR, odds ratio; PC, palliative care.

with even greater cost avoidance than palliative care consultation service alone, except when both are available and provided early in the hospitalization.²²

Ours is the first study to demonstrate that opening a PCU was associated with changes in the processes of care for patients elsewhere in the institution. We hypothesize several possible explanations for these findings. *Priming effects* refer to the multiple unconscious consequences of enhancing or increasing availability or accessibility of a mental construct or stimulus.²³ In this study, it is possible that opening the PCU served as a stimulus that increased awareness of end-of-life care options and the value of goals of care discussions. This in turn may have unconsciously influenced health care providers to consult the palliative care team for discussions of goals of care, including code status, with patients with whom they may not have previously done so and/or earlier than they would have in the pre-PCU period. In addition, in the post-PCU period, the option of transfer to a PCU may have been sufficiently appealing to lead patients to make different choices, compared to the pre-PCU period in which most were

discharged home with hospice (requiring availability of caregivers), or required placement in a skilled nursing facility.

Framing effects may also contribute to different decisions being made, if providers perceived and then framed the choice to go to the PCU as a more positive one than the pre-PCU alternative, home hospice. This could be the result of the positive publicity associated with the opening and positive experiences with the palliative care team in general, and possibly due to the relative ease of transfer to the PCU compared to a discharge home with hospice (Fig. 2). We think it likely that priming and framing effects are part of a multifactorial explanation for the changes we observed, rather than discrete linear processes.

It is possible that the changes seen over the time studied here were not specifically associated with the opening of a PCU, but rather reflect a secular trend toward increased utilization of the specialty palliative care consultation service and a more patient-centered approach to assessment of patient goals. The opening of the PCU did necessitate increasing

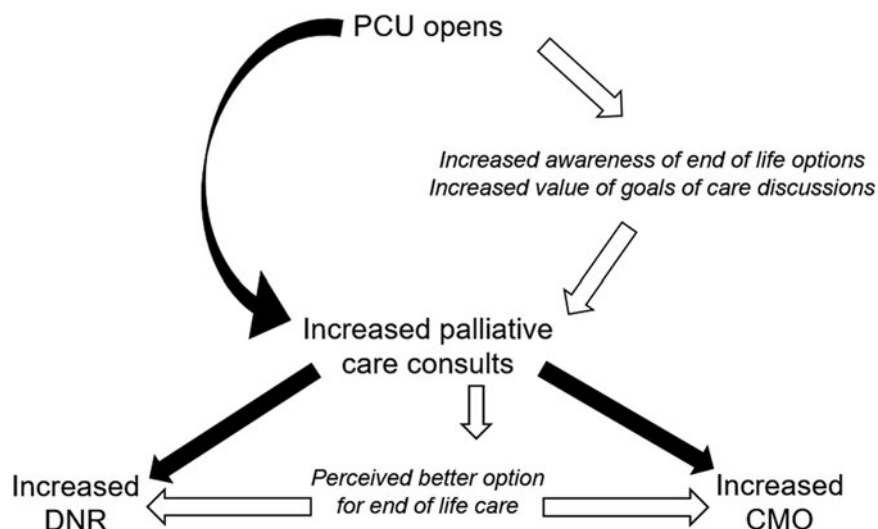


FIG. 2. Hypothesized explanation for changes in DNR and CMO after PCU opening. PCU, palliative care unit.

the specialty palliative care workforce, and at least in the first months after the opening of the PCU, the specialty palliative care team did receive an increased volume of calls requesting information about the PCU. It is possible that the increased workforce and perception of the palliative care team as “gatekeepers” for the PCU may have contributed to a priming effect for referring providers.

Using the framework of priming effects to understand the indirect effects of opening the PCU on care processes elsewhere in the institution raises further questions about the effect of other models of palliative care on care processes. Significant effort has been invested into studying the processes and outcomes of palliative care interventions on patients receiving palliative care, but as with PCUs, there is little understanding of the effect of other palliative care models of delivery of care to nonpalliative care patients. This may be a fruitful area of inquiry as the field of specialty palliative care continues to work to understand how to best provide services in the setting of limited resources.

There are some limitations to this work. First, the post-PCU population was found to be statistically older and sicker than the pre-PCU population, although the eight-month age difference and the slightly higher Charlson index are unlikely to be meaningful with regard to palliative care choices. Furthermore, in analysis adjusting for age and comorbidity, differences in care between periods of time persisted. Second, as described above, it is possible that the increase in palliative care consults represents simply a secular trend of increased utilization with increasing awareness and integration of this service. However, the finding that patients receiving palliative care consultation in the post-PCU period were more likely to be made DNR and CMO than those in the pre-PCU period suggests that regardless of the underlying mechanism increasing palliative care consultation, the care these patients received in the post-PCU period was different.

Third, 20% of the PCU population is directly admitted from the community, which may dilute any direct effect of the PCU on the hospital population. It is not clear to us how these results may have been different in an institution with a PCU admitting only from the hospital, and this is an area of future inquiry. Finally, we recognize that measuring rates of change in DNR and CMO may not be the most accurate way to assess changes in care processes. This is particularly true for DNR, as the content and quality of discussion before a change in code status may vary. In future work, we anticipate identification and utilization of additional outcomes to assess potential changes in care processes.

Strengths of this study include a large sample size allowing for analysis of relatively uncommon events such as transitioning to CMO/end-of-life care. In addition, our approach to analysis and inclusion of assessment of interaction effects allowed us to study the phenomenon described here in more detail. Next steps include studying potential indirect effects of other models of specialty palliative care, such as use of triggers to prompt palliative care consultation in the intensive care unit.

Conclusions

In this single-center study, the opening of a PCU was associated with changes in care processes for patients admitted with serious illness, not just patients transferred to the PCU

itself. This is the first work to find such a spillover effect from opening a PCU on care of patients elsewhere in the institution, raising questions about similar spillover effects of other models of palliative care.

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