Original Article

Improving End-of-Life Care: Development and Pilot-Test of a Clinical Pathway

Marilyn Bookbinder, PhD, RN, Arthur E. Blank, PhD, Elizabeth Arney, RN, MA,
David Wollner, MD, Pauline Lesage, MD, Marlene McHugh, RN, FNP,
Rose Anne Indelicato, RN, ANP, Stephen Harding, STM, BCC,
Arkady Barenboim, MD, PhD, Tahir Mirozyev, MD, and Russell K. Portenoy, MD
Department of Pain Medicine and Palliative Care (M.B., E.A., D.W., P.L., M.M., R.A.I., S.H., A.B., T.M., R.K.P.), Beth Israel Medical Center, New York, New York; and Department of Family and Social Medicine (A.E.B), Albert Einstein College of Medicine, Bronx, New York, USA

Abstract

Prior studies have revealed deficiencies in the care provided to patients dying from advanced medical illnesses in acute care hospitals. These deficiencies are best addressed through system change, which may include the development of clinical pathways and quality improvement models. The Palliative Care for Advanced Disease (PCAD) pathway was developed by an interdisciplinary team and includes a carepath, a daily flowsheet, and a physician order sheet with standard orders for symptom control. To evaluate the utility of PCAD, the clinical pathway was introduced on three hospital units (Oncology, Geriatrics, and an inpatient palliative care/hospice unit) as part of a quality improvement initiative and outcomes were compared to two general medical units receiving usual care. A chart audit tool (CAT) was used to review medical records of 101 patients who died on one of these five units during the year prior to implementation (baseline) and 156 who died during the nine months of the PCAD intervention. Four indices from CAT evaluated change over time: the mean number of 1) symptoms assessed, 2) problematic symptoms, 3) interventions consistent with PCAD, and 4) consultations requested. Nine of 27 (33%) patients on the Oncology/Geriatrics units and all 50 patients who died on the palliative care/hospice unit were placed on PCAD. During the PCAD intervention, dying patients who resided on Geriatrics, Oncology and palliative care/hospice units were more likely to have DNR orders than the comparison units, whereas the comparison units were more likely to use "morphine infusions" and cardiopulmonary resuscitation than the units that received the PCAD intervention. The mean number of symptoms assessed increased significantly in all units ($P < 0.001$ *for all comparisons). The number of problematic symptoms identified (*$P = 0.014$*) and the number of interventions consistent with PCAD increased only on the palliative care/hospice unit (*$P = 0.021$*). The number of medical consultations declined on all units and reached significance on the Geriatrics and*

Address reprint requests to: Marilyn Bookbinder, PhD, RN, Dept. of Pain Medicine and Palliative Care, Beth Israel Medical Center, First Avenue at 16th Street, New York, NY 10003, USA.

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*Oncology units (*P = *0.037). Although these results reflect less than one year of the PCAD intervention and must be considered preliminary, they suggest that 1) a clinical pathway such as PCAD can serve as a managerial and educational tool to improve the care of the imminently dying inpatient; 2) a PCAD clinical pathway can be implemented on hospital units as a quality improvement initiative—a "PCAD intervention;" 3) a PCAD intervention can change outcomes in a positive direction, as measured using a chart audit tool; 4) a PCAD intervention can promote aggressive symptom assessment and treatment when goals of care are aimed at comfort; and 5) changes may occur in units that do not directly receive the intervention, a phenomenon that suggests the possibility of diffusion. Further study of this systems-oriented approach to change is warranted and should include direct assessment of patient and family outcomes, as well as measures of process.*

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Key Words

End of life, pathway, quality improvement, palliative care

Introduction

Most people in the United States die in acute care hospitals.[1] A recent study showed that the last place of care for 67% of 1578 decedents was a hospital or nursing home.[2] Optimal palliative care for the dying inpatient should minimize the suffering of the patient and family, provide an opportunity for closure, and ensure the use of interventions appropriate for the goals of care. Unfortunately, there are well-documented deficiencies in this care. For example, a survey of almost 10,000 patients with advanced illnesses identified high rates of uncontrolled pain, poor physician–patient communication, inadequate use of advance directives, and a high likelihood of unwanted medical interventions at the end of life.[3] Another survey of more than 13,000 elderly cancer patients in nursing homes documented undertreatment of pain.[4]

Deficiencies in the care of dying inpatients could be best addressed through a systems-oriented approach.[1] Clinical protocols or pathways may be incorporated into this approach and have become useful tools to reduce variation in services and practices, increase predictability in desired outcomes, and reduce costs.[5–9] Although they may be implemented in varied ways, they all provide a structured action plan that defines the key events, activities, and the expected outcomes of care for each discipline during each day of care.[10] Process audit tools typically accompany pathways and are used to track variances between care that is planned and care actually given. The treatment algorithms included in pathways are built on "best practices" and offer clinicians reproducible methodology for managing difficult problems.[11–13]

A clinical pathway to improve palliative care for inpatients who are expected to die from advanced disease offers a systems-oriented approach to induce organizational change, improve patient access to resources, enhance communication, and directly redress deficiencies in care. We describe the development of this clinical pathway and a quality improvement (QI) strategy for implementation in a hospital setting, and present the results of a pilot test in selected hospital units.

Methods

The project was supported by a two-year grant from the New York State Department of Health Quality Measurement. There were three elements: First, we formed a Quality Improvement (QI) Team and developed a Palliative Care for Advanced Disease (PCAD) clinical pathway. Second, we developed an implementation model for the pathway, the "PCAD intervention," based on QI methodology. Third, we conducted a pilot-test of the PCAD pathway and intervention on hospital units with a relatively high volume of dying patients.

Quality Improvement Team and PCAD Pathway

QI Team. The PCAD QI Team consisted of nurses, physicians, an ethicist, researchers, educators, a pharmacist, social workers, a dieticians, and chaplains. Local champions from the study units implementing PCAD joined four subcommittees of the QI Team, which met concurrently during the grant period to develop the PCAD intervention and oversee its piloting. Two part-time advanced practice nurses, supported by the grant, coordinated the activities of the QI team and helped implement the PCAD intervention on selected hospital units.

PCAD Pathway. A clinical pathway that reflected best practices was developed from the literature and experts in the field. Guidelines from professional organizations, such as the National Hospice and Palliative Care Organization,[14] the American Geriatric Society,[15] and others,[16–25] were consulted in creating the three structural components: a) an interdisciplinary care path; b) nurses' daily documentation flowsheet; and c) a standardized physician's order sheet with guidelines for medical management of 12 symptoms prevalent at the end of life. The components were targeted to the care of inpatients who were imminently dying and perceived to have life expectancies measured in days or weeks, and would typically be considered candidates for "comfort care." The PCAD pathway and instructional manual can be downloaded from www.StopPain.org.

Interdisciplinary Care Path. The PCAD care path addressed those clinical domains relevant to end-of-life care, including symptom control, advance directives, communication issues, and support for the family. The goal was to shape the responses of staff such that treatment respected patients' values and decisions, reduced unnecessary interventions, increased symptom assessment and treatment, enhanced support for families, and facilitated appropriate referrals. The care path also emphasized bereavement support and assessment of families at risk for complicated grieving. Among the elements included in the care path were automatic referrals to social work and chaplaincy, a debriefing session with staff, and mailing of a condolence card and educational pamphlet to the family after the patient's death.

Nurses' Daily Flowsheet. The nurses' flowsheet included a daily recording of assessments and interventions. Interventions included: 1) recording of advance care planning; 2) "comfort checks" (routine symptom assessment in lieu of vital signs); 3) documentation of the use of symptom control medications, mouth care, skin care, wound care, and other elements of optimal nursing support in this setting; 4) monitoring of patient and family education/counseling; and 5) family assessment for complicated grieving and bereavement support.

Standardized Physician Order Sheet. A standardized order sheet encouraged optimal use of drugs, nondrug therapies, and consultative services. Among the orders prompted on the form were referrals to the Departments of Pain Medicine and Palliative Care (DPMPC), Rehabilitation Medicine, or Psychiatry. The back side of the form included guidelines for managing 12 symptoms.

PCAD Intervention

Conceptual Framework. System-level implementation of the PCAD pathway was conceptualized as a quality improvement (QI) activity. Rogers' five stage diffusion of innovations theory[26] (awareness, persuasion, decision-making, implementation, and confirmation) was used as an overarching framework for understanding the process of changing clinician behaviors, and a specific QI methodology (FOCUS-PDCA)[27] guided the actions of a QI team. The latter methodology, which has been successfully used in an inpatient setting to improve cancer pain management,[28] encourages processes for data gathering and education, and feedback-analysis. Processes are aimed at improving professionals' competence, knowledge, attitudes, skills, and communication; reducing barriers created by hospital systems; and providing an ongoing monitoring/feedback approach to measure outcomes and raise standards of practice.

Components of the PCAD Intervention. The PCAD intervention was designed to enhance acceptance of the PCAD pathway by staff and provide the basis for the monitoring of process and outcomes. The intervention consisted of three components: 1) an educational program and materials, 2) an implementation strategy, and 3) evaluation-feedback methods for the pilot test. In anticipation of the pilot test, the intervention was developed on three hospital units with a relatively high volume of dying patients, specifically the Oncology and Geriatric units, and the inpatient unit of the DPMPC (collectively, the "study units").

Educational Program and Materials. An educational program, targeted to unit staff, was conducted by the advanced practice study nurse and a DPMPC palliative care physician. Nurses on the study units, including night shifts, attended an educational session that focused on end-of-life care and the use of the PCAD pathway. House staff and physician assistants attended the case-based teaching rounds, which were conducted by physicians from DPMPC. By the third month after implementation began, sessions designed as an orientation to PCAD, which were led by DPMPC physicians, had been integrated into the material presented to rotating Oncology and Geriatrics house staff. These sessions used case studies to illuminate end-of-life issues, such as advanced directives, withholding and withdrawal of treatment, DNR and symptom control.

Implementation Strategies. On each of the study units, a nurse leader (Nurse Manager, Clinical Nurse Specialist, or Case Manager) agreed to act as a liaison to the project. This nurse leader played an essential role, scheduling staff for education, supporting culture change, and acting as liaison to the physicians who admitted patients to the units. The PCAD intervention was introduced sequentially to the three study units using insights learned from the previous unit to "tweak" the "roll out" on the next unit. With the start of the educational program and orientation to the PCAD pathway, an effort began to identify individual patients who may be appropriate for placement on the pathway. Implementation of PCAD required a physician's order and was preceded by a discussion with the patient or patient's family. Although written consent for PCAD was not required because the pathway reflected best-accepted clinical practice, assent was perceived to be important to assure that patients and families understood the goals of care, as reflected in adoption of the PCAD pathway. The study coordinators and unit leadership staff gave specific education about PCAD to families, emphasizing their intent to provide comfort.

All patients on the study units were evaluated for their appropriateness for PCAD during daily morning report and at weekly discharge planning rounds. Staff nurses judged each patient's eligibility by asking the question, "Would you be surprised if this patient died during this admission?"[29] This query typically stimulated clinical team discussions about the patient's goals of care. If a patient was considered appropriate for the PCAD pathway during one of these meetings, the nurse leader on the unit discussed this perspective with the patient's primary physician.

Evaluation-Feedback Tools. As part of the PCAD intervention, the QI team also selected or developed specific evaluation tools. These tools were used in the pilot test of the PCAD pathway. Assessment of feasibility was considered the primary aim of the pilot and the initial tools largely measured process, rather than outcomes. Although the need to collect outcome data directly from patients and families was acknowledged as critically important, this evaluation could not be performed within the constraints of this initial pilot. Hence, the following tools were chosen to assess practices and provide feedback related to end-of-life care, specific practices related to the use of the PCAD pathway, and the knowledge and attitudes of staff.

- Chart Abstraction Tool (CAT). The CAT is a 100-item chart audit tool adapted from Fins et al.[30] It elicits information in six areas: demographics, admission/referral data, end-of-life decision making, symptom assessment/management, death, and resource utilization data. Items include the number of referrals, interventions and tests performed, and whether bereavement services were offered to families. Inter-rater reliability among four nurse and physician coders yielded greater than 95% consistency. A codebook with explicit instructions for interpreting and locating data facilitated high consistency.

- Process Audit Tool (PAT). The staff's adherence to the specific elements of the PCAD pathway were monitored using a 34-item Process Audit Tool (PAT). The tool, designed by the authors, elicited quantitative and qualitative information from professionals. An index (total percent adherence with 34 items) was constructed to assess adherence to the PCAD pathway.
- Palliative Care Knowledge Quiz for Nurses (PCQN). The PCQN is a 20-item true/false survey designed to assess knowledge about philosophy and principles of palliative care, symptom management, and provision of psychosocial and spiritual care. The tool has undergone extensive validity and reliability testing.[31]

Pilot Test of the PCAD Intervention

The development of the PCAD pathway and the PCAD intervention required nine months. The pilot test was completed during a second nine-month period. Approval for the pilot was obtained from the Institutional Review Board of Beth Israel Medical Center. The pilot was quasi-experimental and involved the acquisition of relevant pre-post data from patient records and nursing staff on the three study units and on two general medical units (the "comparison units"). Among the study units, the inpatient unit of the DPMPC (IPU-DPMPC), which predominantly cares for hospice patients, was expected to have a relatively sophisticated understanding of palliative care practice and was included in the pilot to benchmark data for comparison with the other units.

Because this was a pilot study, and we knew the sample size would be small, we wanted to incorporate a unit which dealt with dying patients, but which would not be part of the study units. The rationale for including this unit was to strengthen the interpretation of the results in the face of limited sample size, and a hospital environment which was subject to the vagaries of JCAHO initiatives regarding pain. The expectation was that the pattern of results—the intervention unit—would look like the other unit at inception, and dissimilar to the hospice but that over time, the intervention unit would approach the standard of the hospice and differ from the control unit. It was anticipated that the pattern of results would help establish the credibility of the argument that the QI intervention made a difference.

Data Collection. Using the CAT, baseline data were collected retrospectively from the charts of patients who died on the three study units and two comparison units during the year prior to the study. During the nine-month post-implementation phase, the charts of all patients who died on the three study units and the two comparison units were reviewed prospectively. A total of 101 charts were reviewed for the baseline (IPU-DPMPC 20, Oncology/Geriatrics units 41, comparison units 40) and 156 charts were reviewed during the period of the pilot study (IPU-DPMPC 55, Oncology/ Geriatrics units 51, comparison units 50).

The PAT was completed by study personnel to track the extent to which the care given to patients placed on the PCAD pathway was consistent with the pathway. Given the small number of patients placed on the PCAD pathway from the Oncology and Geriatrics unit, and the short survival of these patients, the PAT could not be applied on these study units and its use was limited to 50 patients placed on the PCAD pathway from the IPU-DPMPC. Data collection was stopped when adherence reached >90% on all aspects of the pathway ($n = 30$).

Nurses from study units completed the PCQN prior to implementation of the PCAD intervention, and again four months after the intervention. Additional information about staff attitudes was obtained from weekly meetings with unit leaders, and nine focus groups with day and night nursing staff.

Data Analysis. Pre-post data from the CAT, PAT and PCQN were tabulated. Given the small number of patients entered on the PCAD pathway, PAT data were not further analyzed. Chi-square analyses were conducted to assess item-by-item differences on the CAT among the study units. To supplement these item comparisons, and to reduce the number of pairwise comparisons, four indices were created by summing appropriate scores from the CAT data: 1) symptoms assessed during the last two days of life (possible scores from 0 to 12); 2) the number of problematic symptoms identified during the last two days of life (scores from 0 to 12); 3) the number of interventions (following PCAD guidelines) addressing symptoms during the last two days of life (scores from 0 to 12); and 4) the number of inpatient consultations requested (scores from 0 to 7). Pre- and post-analyses on the CAT summary indices were adjusted for differences found among the units in patient age, length of stay, and whether or not a patient was admitted through the ED. All analyses of the CAT summary indices were conducted using SPSS PC's Analysis of Covariance (ANCOVA). Part of SPSS PC's General Linear Model, the ANCOVA procedure can handle the unequal sample sizes among study units, adjust for differences in length of stay, age, and whether the patient was admitted through the Emergency Department.[32] Following an overall significant *F* test, these analyses allowed for the post-hoc comparisons of means while protecting tests of significance against multiple comparisons and provides a set of adjusted means. Although ANCOVA may not always be an effective approach to control for baseline differences, it was used in this case in an effort to recognize some important baseline differences and try to adjust for them as few non-parametric approaches handle our covariates.

Results

During the nine-month pilot, the PCAD pathway was ordered for 9 of the 27 (30%) Oncology or Geriatrics patients who were considered eligible by nursing staff, and for all 50 IPU-DPMPC patients who were considered eligible. All of the 50 IPU-DPMPC patients who were placed on PCAD were hospice patients and the discussion about goals of care that occurred as part of hospice enrollment facilitated use of the PCAD pathway. The 18 of 27 eligible patients in Oncology/Geriatrics who did not receive PCAD were excluded for varied reasons. Seven (26%) patients and families requested that, "everything be done," including two families who ascribed their view to religious and cultural traditions. Seven (26%) patients had unexpected changes in physical status: 3 died suddenly and 4 "rallied" and were discharged home. In four cases (18%), physicians resisted using the pathway, responding that there was too much paperwork or that their orders and practices were already consistent with PCAD guidelines.

Survival following the ordering of PCAD also varied. For those 50 patients residing on the IPU-DPMPC, the duration averaged 7.5 days (range 1–22). For the Oncology/Geriatrics patients, 3 died while the PCAD pathway was being initiated, and the others survived 2–4 days.

The PAT was used to track adherence to the elements of the PCAD pathway during treatment of the initial 30 patients who died on the IPU-DPMPC. The instrument was completed until staff adhered to $>90\%$ of all aspects of the pathway. In 10% of cases, clinicians were not present with physicians when the family meeting took place and goals of care were discussed. This lack of communication to others created problems in continuity of care. This feedback resulted in a unit-based QI study to improve the presence of another staff member.

The demographics of the 101 patients who provided CAT data from the year prior to the PCAD intervention (IPU-DPMPC 20, Oncology/Geriatrics units 41, comparison units 40) were compared to the demographics of the 156 patients who died during the nine-month pilot test period (IPU-DPMPC 55, Oncology/Geriatrics units 51, comparison units 50) (Table 1). The IPU-DPMPC sample was slightly younger, had shorter lengths of stay, and more cancer diagnoses. Not surprisingly, lower numbers of IPU-DPMPC patients were admitted through the Emergency Department.

Responses to Selected CAT Items

Baseline Period. During the baseline period (Table 2), the IPU-DPMPC had the highest proportion of dying patients 1) with designated surrogate decision makers (signed health care proxy forms) (IPU-DPMPC 75%, Oncology/Geriatrics units 27%, comparison units 20%, $P < 0.0001$); 2) who were considered to be dying by the staff (IPU-DPMPC 95%, Oncology/Geriatrics units 66%, comparison units 45%, $P = 0.001$); 3) with a "comfort care" plan in place (IPU-DPMPC 90%, Oncology/Geriatrics units 46%, comparison units 22%, $P < 0.0001$); and 4) with a chaplain consultation (IPU-DPMPC 58%, Oncology/Geriatrics units 14%, comparison units 8%, $P < 0.0001$). The IPU-DPMPC was least likely to have patients receiving a "morphine infusion" at the end of life (IPU-DPMPC 10%, Oncology/Geriatrics units 42%, comparison units 32%, $P = 0.046$). Patients dying on all of the study units were more likely to have a "Do Not Resuscitate" (DNR)

Table 1
Patient Characteristics of Chart Reviews
(n = 257; Pre = 101, Post = 156)

	IPU-DPMPC		Study Units		Comparison Units	
	Pre (%)	Post (%)	Pre (%)	Post (%)	Pre (%)	Post (%)
Mean age	69	69	74	71	78	72
Mean LOS	7	8	18	24	15	15
Percent Medicare	25	21	22	33	8	33
White	75	49	55	51	60	35
Admitted through the ED	10	13	83	72	85	88
Cancer	86	69	66	46	41	42
Sample size[a]	20	55	41	51	40	50

[a] Sample size varies by question because of missing data.

order than those dying on the comparison units (IPU-DPMPC 100%, Oncology/Geriatrics units 95%, comparison units 72%, $P = 0.002$).

Several other differences were identified during the baseline period. Patients who died on the comparison units were more likely than those who died on the study units to have confusion and delirium assessed (IPU-DPMPC 47%, Oncology/Geriatrics units 42%, comparison units 82%, $P = 0.001$), but agitation was evaluated more often on both the IPU-DPMPC and the comparison units than the Oncology/Geriatrics units (IPU-DPMPC 90%, Oncology/Geriatrics units 42%, comparison units 82%, $P < 0.0001$). Those who died on the Oncology/Geriatrics units were more likely to have decubitus ulcers assessed (IPU-DPMPC 40%, Oncology/Geriatrics units 63%, comparison units 32%, $P = 0.017$). There were no differences among the units in the availability of living wills; in consultations with ethics committees, social workers, or pain specialists; in the assessment of diarrhea or nausea and vomiting; or in the documentation of an order to initiate cardiopulmonary resuscitation (CPR).

PCAD Intervention Period. During the nine-month pilot of the PCAD intervention (post-PCAD implementation), the IPU-DPMPC continued to have the highest proportion of patients who were considered to be dying by the staff (IPU-DPMPC 91%, Oncology/Geriatrics units 65%, comparison units 33%, $P = 0.0001$), and patients with a comfort care plan in place (IPU-DPMPC 96%, Oncology/Geriatrics units 55%, comparison units 34%, $P < 0.0001$). Similar to the baseline period, the Oncology/Geriatrics units were most likely to have patients receive a "morphine infusion" at the end of life (IPU-DPMPC 4%, Oncology/Geriatrics units 28%, comparison units 10%, $P = 0.001$), and the study units were more likely to have DNR orders for dying patients than were the comparison units (IPU-DPMPC 100%, Oncology/Geriatrics units 86%, comparison units 69%, $P < 0.0001$). In contrast to the baseline period, the comparison units had a higher proportion of patients having CPR prior to death than the study units (IPU-DPMPC 0%, Oncology/Geriatrics units 2%, comparison units 24%, $P < 0.0001$).

CAT Indices

The CAT data yielded four indices—symptoms assessed (0–12), number of problematic symptoms identified during the last two days of life (0–12), number of symptom interventions consistent with PCAD guidelines during the last two days of life (0–12), and number of inpatient consultations (0–7). Differences among the units in these outcomes were assessed after adjusting for age, length of stay, and whether a patient was admitted through the Emergency Department (Table 3). These factors were used in adjusting the CAT indices as there were significant differences among the indices for the various units. Other indices, for example, race, were not significant.

Baseline Period. During the one-year baseline period, the adjusted mean number of symptoms assessed was higher in the IPU-DPMPC (7.2) and comparison units (7.9) than in the Oncology/Geriatrics units (6.1); this difference was statistically significant ($F_{2,95} = 7.328$, $P = 0.013$) and post-hoc comparisons indicated that the study units were different than the comparison unit

Table 2

PCAD Summary Data: Comparisons for Select Outcome Variables Using the CAT

	Percent Responding Yes							
	Baseline				PCAD Intervention Period			
Chart Item	IPU-DPMPC ($n = 20$)	Study Units ($n = 41$)	Comparison Units ($n = 50$)	P-Value[a]	IPU-DPMPC ($n = 55$)	Study Units ($n = 51$)	Comparison Units ($n = 50$)	P-Value
Was a health care proxy present?	75	27	20	<0.000	64	51	50	0.287
Was a DNR present?	100	95	72	0.002	100	86	69	<0.000
Was a living will present?[b]	15	3	5	0.149	13	6	4	0.235
Was the patient considered dying?	95	66	45	0.001	91	65	33	<0.000
Was there a comfort care plan?	90	46	22	<0.000	96	55	34	<0.000
Was the patient on a morphine drip?	10	42	32	0.046	4	28	10	0.001
Was Ethics Committee involved?[b]	0	2.4	2.5	NA	2	4	2	NA
Was there a social work consult?	37	49	58	NA	100	100	100	NA
Was there a chaplain consult?	58	14	8	<0.000	100	57	57	NA
Was there a pain medicine consult?	33	17	11	NA	100	64	62	NA
Was there a hospice consult?	0	33	22.2	NA	100	64	56	NA
Was pain assessed?[b]	100	85	100	0.010	96	100	98	NA
Was confusion/delirium assessed?	47	42	82	0.001	94	100	90	0.073
Was agitation assessed?	90	42	82	< 0.000	90	100	88	0.048
Was respiratory status assessed?[b]	100	98	100	NA	100	100	98	NA
Was decubitis ulcer assessed?	40	63	32	0.017	98	98	90	0.079
Was nausea/vomiting assessed?	45	44	65	0.124	100	100	96	NA
Was diarrhea assessed?	46	56	64	0.500	100	98	96	NA
Did the patient receive CPR prior to death?[b]	0	6	5	NA	0	2	24	<0.000
Was transfer to home, etc. discussed with patient or family?	94	81	88	NA	45	72	54	NA
Was the family referred for bereavement?	100	88	90	NA	78	100	27	NA

CAT = Chart Abstraction Tool.

[a] Tests of significance were conducted using chi-square or Fisher's exact test.

[b] NA indicates where more than 50% of cells had expected values of less than 5.

Table 3
PCAD Summary Data: Comparisons of CAT Indices by Units

	Percent Responding Yes							
	Baseline				PCAD Intervention Period			
	IPU-DPMPC ($n = 20$)	Study Units ($n = 41$)	Comparison Units ($n = 50$)	F Test	IPU-DPMPC ($n = 55$)	Study Units ($n = 51$)	Comparison Units ($n = 50$)	F Test
Symptom assessment								
Crude mean[b]	7.6	6.0	7.9		10.2	10.5	9.5	
Adjusted mean	7.2	6.1	7.9	$F_{2,95} = 7.328$[c]	10.5	10.3	9.4	$F_{2,150} = 4.463$[d]
Problematic symptom identified								
Crude mean	4.8	3.5	3.4		3.7	3.9	2.7	
Adjusted mean	4.9	3.5	3.4	$F_{2,95} = 2.917$[e]	4.0	3.6	2.7	$F_{2,150} = 3.461$[d]
Number of interventions								
Crude mean	5.1	4.1	3.9		4.1	4.4	3.1	
Adjusted mean	5.5	4.0	3.8	$F_{2,95} = 3.478$[d]	4.5	4.1	3.0	$F_{2,150} = 4.396$[d]
Number of inpatient consultations								
Crude mean	1.6	4.0	3.3		2.2	5.1	4.3	
Adjusted mean	2.2	3.7	3.3	$F_{2,97} = 7.949$[c]	2.8	4.5	4.4	$F_{2,139} = 19.766$[c]

CAT = Chart Abstraction Tool.
[a] Select outcomes: These indices were created by summing the number of events documented during the last two days of life. The number of symptoms assessed could range from 0 to 12.
[b] SPSS PC's General Linear Model was used to create the means and adjusted means. Because significant differences were found among units at baseline, the means were adjusted for covariates of length of stay, age, and whether the patient was admitted through the ED.
[c] $P \geq 0.001$.
[d] $P \geq 0.01$.
[e] $P \geq 0.05$.

($P = 0.001$). The adjusted mean number of problematic symptoms identified during the last 2 days of life was greatest among the IPU-DPMPC patients than the other groups (IPU-DPMPC 4.9, Oncology/Geriatrics units 3.5, comparison units 3.4, $F_{2,95} = 2.917$, $P = 0.05$); the post-hoc comparisons indicated that the IPU-DPMC differed from both the Oncology/Geriatrics units ($P = 0.031$) and the comparison units ($P = 0.020$). The adjusted mean number of symptom interventions following PCAD guidelines also differed among units ($F_{2,95} = 3.478$, $P = 0.035$) and post-hoc comparisons revealed that the Oncology/Geriatrics units and the comparison units were comparable, but differed from the IPU-DPMPC (IPU-DPMPC 5.5, Oncology/Geriatrics units 4.0, comparison units 3.8, $P = 0.025$). In contrast, there were significantly fewer consultations on the IPU-DPMPC (2.2) than the Oncology/Geriatrics units (3.7) or comparison units (3.3) ($F_{2,95} = 7.949$, P=0.001), and the post-hoc comparison revealed that the difference between the IPU-DPMPC and the comparison units remained significant ($P = 0.016$).

PCAD Intervention Period. With the exception of the number of symptom interventions provided to the dying, the differences among the various units in the CAT indices remained stable during the implementation of the PCAD intervention. There again were significant differences between both the IPU-DPMPC unit and the comparison units (10.5 vs. 9.4, $P = 0.02$) and the Oncology/Geriatrics units and the comparison units (10.3 vs. 9.4, $P = 0.006$) in the adjusted mean number of symptoms. The differences in the number of problematic symptoms identified during the last two days of life (IPU-DPMPC 4.0, Oncology/Geriatric Units 3.6, comparison units 2.7, $F_{2,150}$, = 3.461, $P = 0.034$) were again significantly different between the IPU-DPMPC and comparison units ($P = 0.03$) and the Oncology/Geriatrics units and comparison units ($P = 0.017$). In comparison to the baseline period, during which time the Oncology/Geriatrics units and the comparison units were comparable, but differed from the IPU-DPMPC, the number of symptom interventions during the PCAD intervention (IPU-DPMPC 4.5, Oncology/Geriatrics units 4.1, comparison units 3.0, $F_{2,150} = 4.396$, $P = 0.014$) showed that the IPU-DPMPC and the Oncology/Geriatrics units were comparable to each other and both differed from the comparison units (IPU-DPMPC vs. comparison units, $P = 0.010$; and

Oncology/Geriatrics units vs. comparison units, $P = 0.011$). Finally, the adjusted mean number of consultations during PCAD implementation was similar to the baseline period, with fewer consultations on the IPU-DPMPC (2.8) than either the Oncology/Geriatrics units (4.5, $P = < 0.0001$) or the comparison groups 4.4, $F_{2,139} = 19.766$, $P = 0.001$).

Comparison Between Baseline Period and PCAD Intervention Period

To further evaluate the changes over time in the care of dying patients, the mean scores between the baseline period and PCAD implementation period for each of the CAT indices were compared using *t*-tests (Table 4). This limited pre-post difference analysis was considered exploratory and was not adjusted for any potential confounders. The mean number of symptoms assessed increased significantly on all units (Oncology/Geriatrics −4.5, IPU-DPMPC −2.6, comparison units −1.6; pre–post comparison $P < 0.001$ for each unit). In the IPU-DPMPC, there was a significant decrease in the number of problematic symptoms identified (1.1, $P = 0.014$) and interventions employed (1.0, $P = 0.021$). The Oncology/Geriatrics units showed a significant increase in the number of consultations requested (−1.1, $P = 0.037$).

Nurses' Palliative Care Knowledge

Ninety percent ($n = 138$) of nurses on study units took the PCNQ (IPU-DPMPC 17, Oncology 38, and Geriatrics 35) at baseline and four months following implementation of PCAD. Nurses were predominantly women (83%), averaging 44 years old, and had greater than 10 years (47%) of nursing experience. Most nurses were educationally prepared at the baccalaureate (52%) or masters' degree (15%) level. Table 5 shows that 15 of 20 test items (75%) were targeted for continued education after the first test, that is, items with >20% incorrect responses. Fifty percent of the sample gave incorrect responses to four items: 1) pain threshold is lowered by anxiety or fatigue (True), 2) palliative care is appropriate only in a situation where there is evidence of a downhill trajectory or deterioration (False), 3) during the last days of life, the drowsiness associated with electrolyte balance may decrease the need for sedation (True), and 4) in high doses, codeine causes more nausea and vomiting than morphine (True). Four months post-implementation, positive increases (choosing the preferred answer) were found in all items, with greater than 5% increases for 15 of 20 items. A *t*-test for independent samples revealed statistically significant increases between the combined sample at baseline and post-implementation

Table 4
Comparison of Mean Pre–Post Differences on Four CAT Indices[a]

Comparison	Difference in Means[b] (Pre minus Post Test)	SE of Difference	*P*-Value
Symptoms assessed			
IPU-DPMPC	7.6 − 10.2 = −2.6	0.485	<0.001
Study units	6.0 − 10.5 = −4.5	0.282	<0.001
Comparison units	7.9 − 9.5 = −1.6	0.432	<0.001
Problematic symptoms identified			
IPU-DPMPC	4.8 − 3.7 = 1.1	0.418	0.014
Study units	3.5 − 3.9 = −0.4	0.430	0.386
Comparison units	3.4 − 2.7 = 0.7	0.447	0.124
Number of intervention			
IPU-DPMPC	5.1 − 4.1 = 1.0	0.434	0.021
Study group	4.1 − 4.4 = −0.3	0.446	0.484
Control group	3.9 − 3.1 = 0.8	0.470	0.109
Number of inpatient consultations			
IPU-DPMPC	1.6 − 2.2 = −0.6	0.345	0.062
Study units	4.0 − 5.1 = −1.1	0.531	0.037
Comparison units	3.3 − 4.3 = −1.0	0.547	0.068

[a] CAT indices: These select outcomes were created by summing the number of events documented during the last two days of life. The number of symptoms assessed could range from 0 to 12.

[b] SPSS PC's General Linear Model was used to create the means and adjusted means. Because significant differences were found among units at baseline, the means were adjusted for covariates of length of stay, age, and whether the patient was admitted through the ED.

Table 5
Palliative Care Quiz for Nurses: Percent Correct Responses to Pre-Test

Item	IPU-DPMPC ($n = 17$)	Geriatrics ($n = 35$)	Oncology ($n = 38$)	All Units
1. Palliative care is appropriate only in situations where there is evidence of a downhill trajectory or deterioration.	88	80	79	82.33
2. Morphine is the standard used to compare the analgesic effect of other opioids.	65	62	74	67.00[a]
3. The extent of the disease determines the method of pain treatment.	59	60	55	58.00[a]
4. Adjuvant therapies are important in managing pain.	100	91	90	93.67
5. It is crucial for family members to remain at the bedside until death occurs.	88	49	63	66.67[a]
6. During the last days of life, the drowsiness associated with electrolyte imbalance may decrease the need for sedation.	47	43	33	41.00[a]
7. Drug addiction is a major problem when morphine is used on a long-term basis for the management of pain.	88	54	82	74.67[a]
8. Individuals who are taking opioids should follow a bowel regime.	100	91	100	97.00
9. The provision of palliative care requires emotional detachment.	100	77	82	86.33
10. During the terminal stages of an illness, drugs that can cause respiratory depression are appropriate for the treatment of severe dyspnea.	71	47	58	58.67[a]
11. Men generally reconcile their grief more quickly than woman.	71	71	63	68.33[a]
12. The philosophy of palliative care is compatible with that of aggressive treatment.	77	27	34	46.00[a]
13. The use of placebos is appropriate in the treatment of some types of cancer pain.	13	69	82	54.67[a]
14. In high doses, codeine causes more nausea and vomiting than morphine.	47	57	40	48.00[a]
15. Suffering and physical pain are synonymous.	77	60	68	68.33[a]
16. Demerol is not an effective analgesic in the control of chronic pain.	82	51	68	67.00[a]
17. The accumulation of losses renders burnout inevitable for those who seek work in palliative care.	77	44	68	63.00[a]
18. Manifestations of chronic pain are different from those of acute pain.	88	83	84	85.00
19. The loss of a distant or problematic relationship is easier to resolve than the loss of one that is close or intimate.	77	52	63	64.00[a]
20. The pain threshold is lowered by anxiety or fatigue.	47	46	55	49.33[a]
Average Total Score	69	60	66	64
No. of Items for Continued Education	14	16	12	15

[a] Need for Continued Education threshold: >20% incorrect.

total scores ($t = 3.125$, $P < 0.003$). At post-testing, the IPU-DPMPC unit had the highest percentage of correct responses (69%), followed by the Oncology unit at 66% and Geriatric unit at 60%. No statistically significant relationships were found between knowledge scores and years in nursing or at the institution, education, age, or other characteristics.

Discussion

The PCAD pathway—an interdisciplinary care path, a daily documentation flowsheet, and a physician order sheet (www.StopPain.org) was developed in response to a recognized need to improve palliative care at the end of life for inpatients in acute care settings. It attempts to shape clinical behavior by providing guidelines and documentation tools. Prior studies have suggested that clinical pathways of this type can promote significant improvements in patient outcomes.[8,9]

Implementation of a new clinical pathway into busy day-to-day unit practice can be a challenge, particularly when the pathway requires culture changes, new assessments, referrals, processes for decision making and interdisciplinary communication. For this reason, a PCAD intervention was developed using a widely accepted QI methodology (FOCUS-PDCA). The intervention included the formation of a multidisciplinary task force, an education program, specific implementation strategies, and evaluation tools that allow ongoing monitoring and feedback. Among the most important implementation strategies was the identification of a local unit champion, a nurse and physician leader who could assist project staff in the logistics of training, act as a culture change agent, and become the point person for interactions with the physician staff.

The PCAD pathway was adopted by staff, particularly those on the IPU-DPMPC unit, and was perceived to be both a mechanism for encouraging discussions about goals of care and a documentation tool. On the IPU-DPMPC, adherence to the elements of the pathway occurred quickly and approached 100%. Given the nature of the IPU-DPMPC as a hospice/palliative care unit, this degree of acceptance was not surprising. Acceptance of the pathway on the other units was high, as indicated by the routine use of the criterion question ("Would you be surprised if this patient died during this admission?") during daily report. Adherence to the pathway for those patients selected for it from other units could not be assessed because of the small number of patients involved, and evaluation of adherence and the factors that influence it remains an important question for future research.

Acceptance of PCAD represented significant culture change on the study units. This occurred during a relatively brief implementation period. Analysis of chart review data from patients who died (CAT data) before and during PCAD implementation suggested some positive trends across all the units evaluated, with possibly greater change on the study units than comparison units (Tables 2, 3, and 4). Although the changes are modest and the direction of change is not uniform, the data overall suggest that the project to develop and implement PCAD may have contributed to improvement over a period of less than two years (pre-PCAD year to the year of PCAD implementation) in the way dying patients were managed throughout the hospital. Change that was greatest on the study units may have diffused throughout the institution. If confirmed, this observation has important implications for the development of similar programs. System change may be a powerful enough managerial and educational vehicle that implementation on a few key units is a sufficient start for wider improvement in care.

Notes taken at weekly unit meetings give credence to the view that PCAD had an impact that may have exceeded documentation in the limited CAT data. They revealed critical milestones to implementing PCAD. By six weeks, study units were routinely having discussions about patients' goals of care and identifying those eligible for the PCAD pathway at weekly multidisciplinary discharge planning rounds. By month four, palliative care became part of the clinician's vocabulary of "services available," and the pain and palliative care specialist team and hospice were invited to join weekly discharge planning rounds to encourage earlier referrals. Almost immediately, debriefing sessions with staff after a patient died yielded unprecedented discussions about "a peaceful death," the honoring of patient wishes, and the necessity of painful procedures.

These debriefing sessions also focused on education about grief, which appeared itself to have several positive outcomes. The need for better bereavement care on the Oncology/Geriatrics units was recognized early and led to the use of a condolence card and patient education materials after the patient's death. On the Oncology unit, chaplains began a semi-annual bereavement service for families who lost a loved one and staff who cared for them. These results support the value of offering staff the opportunity to talk about their experience and "bring closure" to the personal aspects of caring for patients and families they have come to know and may have watched demise over time.[33]

The success of PCAD depended, in part, on the knowledge and attitudes of front-line clinical staff. We hypothesized that hospice staff, with more experience in end-of-life care, would have higher scores than the Oncology and Geriatrics unit nurses in palliative care knowledge. Results confirmed our expectation—although overall mean scores improved, no significant changes in knowledge scores on the Oncology and Geriatrics units were found pre- to post-implementation. Future educational programs should consider targeting specific competencies with larger clinical groups and more rigorous assessments of changes in behaviors, such as use of algorithms to screen, assess, and quickly manage symptoms.

Many factors may have limited our ability to quantify a positive effect related to the PCAD pathway and PCAD intervention. We could not exercise control over multiple extraneous variables within the system (e.g., referral to the consultation team of the DPMPC), cultural and leadership styles within each unit, exposure of staff to other educational offerings in pain or symptom management, and varied patient diagnoses. Because of resource limitations, the duration of the implementation period was only nine months, shorter than the 1.5–2 years usually required to yield improvements during large-scale QI efforts.[34,35]

Our assessment approach also had limitations. The utility of the PAT could not be assessed adequately because of the small number of patients placed on the PCAD pathway. Further validation is required of the indices created from CAT data. Perhaps most importantly, we did not directly assess patient outcomes, but rather focused on process variables, retrospective outcome variables, and staff knowledge and attitudes.

We also did not initially target physicians for education and system change. Nurses were considered the first-line care providers in end-of-life care and it is far more difficult to create a program targeted to physicians who may or may not be full-time in the hospital and may admit patients rarely. Nonetheless, the importance of the physicians' role in communicating goals of care with patients and families and staff became apparent at the start of the implementation phase and greater efforts to engage them were made as the pilot progressed. We did not assess changes in physician attitudes and knowledge, another limitation, but have noted that requests for the PCAD pathway have continued to appear despite termination of our project.

These limitations suggest areas for future research. First, the PCAD pathway could be revised in a way to further increase its utility. A symptom assessment "trigger" might be added, such as the one described by Ellershaw et al.[36] in a hospice setting to increase the frequency of symptom assessment and treatment and minimize symptom distress for the imminently dying. More dynamic paradigms, such as a pathway that includes a number of treatment algorithms targeting prevalent symptoms or concerns, might be considered. Additional studies may help better refine the pathway by delimiting the nature of so-called "comfort care."[37]

Although the results of the pilot evaluation cannot confirm that the PCAD pathway and PCAD intervention drove improvement in the care of the dying inpatient, the materials created for the project are face valid and the approach to implementation was consistent with accepted QI methodology. Positive trends were identified in clinician knowledge and outcomes related to care that were documented in the medical record. Additional studies of the feasibility and effectiveness of the PCAD pathway are warranted. Evaluation of the pathway is needed over a longer time period with larger samples of cancer and other terminally ill patients in a variety of settings. Studies are needed with more sophisticated assessment methodologies and experimental designs. Explicit methods should be explored to better quantify the social processes of unit-implementation and cultural changes, and the specific elements of the QI method used to implement the pathway (the PCAD intervention). Patient and family outcomes should be assessed directly, and the use of a proxy measure of symptom distress for patients unable to provide self-report should be explored. Studies of the relative impact of interventions at three levels—system (unit and hospital processes), clinician (knowledge, attitudes, and competency), and patient and family (expectations, knowledge, care outcomes)—are needed. Finally, studies should assess the time required to produce change, the sustainability of change, the impact of mediating variables (e.g., local champions or support from hospital administration) that may be key in the process, and the phenomenon of diffusion of change through a system.

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