

Supplementary Table 1: Description of study characteristics in the 49 studies included in the review.

First Author, Ref Year, Country	Level of evidence	Site of care	Disease (%), participants total number; Follow up	Type of intervention	PCT composition	Main outcome measures	Effect on measured outcomes/endpoint (P Value)	Effect on measured outcomes/endpoint
Randomised Controlled Trials								
Carson et al.,[46] 2016, USA	11/13	Mount Sinai Medical Center, University of North Carolina Hospitals, Duke University Medical Center and Duke Regional Hospital (n=4)	Pts requiring 7 days of mechanical ventilation (n=256) and family members (n=365); Follow up 3 months	Two structured family meetings and provision of informational brochure	Support and information team: PC physician, nurse practitioner, social worker, and chaplain	HADS, IES-R, After-Death Bereavement Family Interview, Quality of Communication Scale, Family Satisfaction in the ICU survey, hospital length of stay and 90-day survival	No significant difference in anxiety and depression symptoms in surrogate decision makers (p=0.34). Posttraumatic stress disorder symptoms were higher in the intervention group (p=0.049). There was no difference between groups regarding the discussion of pts preferences (p=0.14). No significant difference between median number of hospital days (p=0.51) and 90-day survival (p=0.96)	<i>No difference in:</i> <ul style="list-style-type: none"> Anxiety and depression symptoms in surrogate decision makers; Discussion of pts preferences; Communication on goal of care and ACP; Median number of hospital days; 90-day survival. <i>Worse outcome for patients:</i> <ul style="list-style-type: none"> Posttraumatic stress disorder symptoms.
Cheung et al.,[16] 2010, Australia	6/13	General ICU of urban tertiary hospital	ICU patients, no info (100%); n=20; Follow up 3-5 days till discharge	Discussions on pt and family-centered decision-making, communication, emotional and practical support, symptom management, spiritual support, patient care	PC team: a physician, registrar, resident and clinical nurse consultant	ICU and hospital length of stay, and changes in composite cores of satisfaction obtained from questionnaires administered to families, nursing staff and intensivists	There were no statistically significant difference between those who had a consultation with the PC team and those who did not in median ICU length of stay (p=0.97), median hospital length of stay (p=0.44), or changes in overall composite satisfaction scores reported by families (p=0.91), nursing staff (p=0.30) and intensivists (p=0.42)	<i>No difference in:</i> <ul style="list-style-type: none"> Median ICU length of stay; Median hospital length of stay; Satisfaction as reported by families, nursing staff and intensivists; ICU and hospital mortality.
Gade et al.,[3] 2008, USA	9/11	Hospitals for Denver, San Francisco,	Cancer (27%) and non-cancer (73%); Total n=512; Follow up 6	Addressing patients' needs for symptom management,	Interdisciplinary PC Service (IPCS) team: palliative care physician and	MCOHPQ, MCOHPQ Emotional/Relationship Area and Spiritual Area Scale,	IPCS pts had fewer intensive care admissions on hospital readmission (p=0.04) and lower 6-month net cost savings for \$4,855 per pt	<i>Improvement in:</i> <ul style="list-style-type: none"> Fewer intensive care admissions on hospital readmission;

		and Portland (n=3)	months post hospital discharge	psychosocial and spiritual support, end-of-life planning, and post hospital care	nurse, hospital social worker and chaplain	MCOHPQ Place of Care Environment scale, the Doctors Nurses/Other Care Providers Communication scale, total health service costs at 6 months post-hospital discharge, survival, number of advanced directives, hospice utilisation.	(p=0.001). IPCS had longer median hospice stays (p=0.04) and completion of advanced directives (p<0.001). IPCS pts reported greater satisfaction with their care experience and providers' communication. There were no differences in survival or symptom control	<ul style="list-style-type: none"> • Longer median hospice stay; • Lower 6-month net cost savings; • Completion of advanced directives; • Patients satisfaction with care experience and providers' communication; <p><i>No difference in:</i></p> <ul style="list-style-type: none"> • Survival; • Pain; • Other symptoms; • Depression.
Hanks et al.,[34] 2002, UK	10/11	The United Bristol Healthcare Trust (UBHT)	Cancer (93%) and non-cancer (7%); Total n=261; Follow up after 1 week	The full PC service: detailed advice, communication to pts medical and nursing team, initiation of follow-up with telephone and in-person consultations with pts, family and medical and nursing staff. Telephone PC service: consultation between PC team, referring doctor, nurse specialist, and member of the ward nursing staff	PC team: two clinical academic consultants, one specialist registrar and three clinical nurse specialist (2.5 full-time equivalent). Access to social worker, rehabilitation staff and the chaplaincy	EORTC QLQ C-30, VAS, MPAC, WONCA scale, MacAdam's Assessment of Suffering Questionnaire, HADS, length of stay, re-admission, and use of health service resources	Highly significant improvement in symptoms, HRQoL, mood and 'emotional bother' in 'full-PCT' at 1 week, maintained over 4 week follow-up. A smaller effect was seen in 'telephone-PCT'; there was no significant difference between the groups. Satisfaction with care in both groups was high and there was no significant difference between them	<p><i>Improvement in:</i></p> <ul style="list-style-type: none"> • Pain; • Other symptoms; • Mood; • HRQoL; • 'emotional bother'; • Satisfaction with care.

Sidebottom et al.,[12] 2015, USA	5/13	Abbott Northwestern Hospital (ANW)	Acute heart failure pts (100%); Total n=232; Follow up on 1 and 3 months	Symptom assessment, addressing emotional, spiritual and psychological aspects of care, coordination of the care orders, recommendations for change in current or future treatment, referrals, and future care planning assessment and discussion	Inpatient PC team: 4 physicians board certified in hospice and palliative medicine, 2 clinical nurse specialists board certified in advanced practice PC nursing, social worker and chaplain.	PHQ-9, MLHF, ESAS	Improvements were greater at both 1 and 3 months in the intervention group for symptom burden, depressive symptoms and QOL. QOL scores increased by 12.92 points in the intervention and 8 points in the control group at 1 months (p<0.001). Improvement in symptom burden was 8.39 in the intervention group and 4.7 in the control group at 1 months (p<0.001). ACP was the only secondary outcome associated with the intervention (p=0.033)	<i>Intervention group improvement in:</i> <ul style="list-style-type: none"> • Pain; • Other symptoms; • Depressive symptoms; • QOL; • ACP; <i>Improvement in control:</i> <ul style="list-style-type: none"> • Pain; • Other symptoms; • QOL; 	
Non-randomised trial/quasi-experimental studies									
Duenk et al.,[19] 2017, The Netherlands	9/9	General hospitals in Netherlands (n=6)	COPD (100%); Total n=228; Follow up 3, 6, 9, 12 months	Monthly proactive PC meetings): creating a patient-tailored proactive PC plan, anticipation of illness etc.	Specialised PC Team (SPCT): no info	SGRQ, McGill, HADS	No significant difference in change scores of the SGRQ total at 3 months between groups (p=0.70). However, pts who received proactive PC experienced less impact of their COPD at 6 months (p=0.04) and had more often made advanced care planning choices (p=0.003). Other secondary outcomes were not significantly different	<i>Improvement in:</i> <ul style="list-style-type: none"> • COPD experience; • ACP choices; <i>No difference in:</i> <ul style="list-style-type: none"> • QOL; • Psychological well-being; • Number and length of hospital readmission. 	
Jack et al.,[35] 2006, UK	7/9	General National Health Service university hospital	Cancer (100%); Total n=100; Follow up at day 4 and day 7	Individualised assessment, psychological support, symptom control and evaluation (e.g.	PC team: 4 clinical nurse specialist (all educated to degree level and with additional specialist palliative and	PACA	Pain: No difference on initial assessment. Significant improvement between groups was observed in II and III assessment (p =0.029 and p<0.01)	<i>Improvement in:</i> <ul style="list-style-type: none"> • Pain. 	

				appropriate analgesia)	cancer qualifications). The medical staff comprised a PC consultant and a specialist registrar			
Kao et al.,[14] 2014, China	9/9	National Taiwan University Hospital	Cancer (100%), Total n=60; Follow up 1 week	Assisting pts care needs and providing with total care	Hospital-based PC team: fully hospice trained physicians, nurses, social workers and chaplains	SDS, HADS, SWBS, SSS	Significant improvement was seen in edema, fatigue, dry mouth, abdominal distention and spiritual well-being in the intervention group (p<0.05). No difference between groups on anxiety, depression and feeling of social support	<p><i>Improvement in:</i></p> <ul style="list-style-type: none"> • Edema, fatigue, dry mouth, abdominal distention; • Spiritual well-being. <p><i>No difference in:</i></p> <ul style="list-style-type: none"> • Anxiety, depression; • Feelings of social support.
May et al.,[66] 2016, Ireland	9/11	Mount Sinai Medical Center, Froedtert Hospital, Virginia Commonwealth University-Massey Cancer Center, Mount Carmel East, Mount Carmel West and Mount Carmel St. Ann's (n=6)	Cancer (100%); Total n=906;	Dominant model of PC delivery in US hospitals including identification and treatment of psychological and physical symptoms, advanced care planning etc.	PC consultation team (PCCT): no info	Total direct hospital costs for the index hospitalisation	The receipt of a PC consultation within two days of admission was associated with 22% lower costs for pts with a comorbidity score of 2-3 and with 32% lower costs for those with a score of 4 or higher compared to usual care. Earlier consultation was also found to be associated with a large cost-saving effect for all subsamples defined by multi-morbidity	<p><i>Improvement in:</i></p> <ul style="list-style-type: none"> • Costs for pts with comorbidity; • Costs when pts are having consultations earlier.
May et al.,[67] 2016, Ireland	8/11	US hospitals (n=4)	Cancer (100%); Total n=969	Treatment of pain and other symptoms, clarifying treatment options, establishing goals of care	PCCT: specialist-led interdisciplinary team of a physician, a nurse, and a social worker with chaplaincy	Hospital cost databases, medical records and questionnaires	Treatment effect estimates are highly sensitive to methods that control for LOS, complicating interpretation. Both the magnitude and significance of results varied widely with the method of controlling for LOS. When	<p><i>Mixed results:</i></p> <p>Both the magnitude and significance of results varied widely with the method of controlling for LOS.</p>

				and advance plans, and assistance with transition planning	and psychiatry support		incorporated intervention timing into analysis, results were robust to LOS-controls	
Controlled before-and-after studies								
Norton et al.,[47] 2007, USA	6/11	Tertiary care hospital, Medical Intensive Care Unit (MICU)	Cancer (17%) and non-cancer (83%); Total n=191; Follow up 4 months and 7.5 months	Proactive PC consultation: Basic PC - assessment of PC needs such as chart review, history of illness, symptoms, giving further recommendations, family discussions etc. Complete PC -basic PC consultation and full attendance of PC physician, involvement of PC team in family meetings, assessing efficacy of treatment, additional support as needed (chaplain, music, psychologist)	PC team: Attending PC physician, PC nurse practitioner	LOS for entire hospitalisation, in the Medical Intensive Care Unit (MICU), and from MICU admission to hospital discharge.	Patients in the proactive PC group had significantly shorter length of stay in MICU (p=.0001). There were no differences between the two groups on total LOS in the hospital or LOS from MICU admission to hospital discharge	<i>Improvement in:</i> <ul style="list-style-type: none"> Shorter LOS in MICU. <i>No difference in:</i> <ul style="list-style-type: none"> Total LOS in the hospital or LOS from MICU admission to hospital discharge.
Concurrent cohort studies								
Colombet et al.,[50]	8/11	Cochin Hospital	Cancer (100%); Total n=521;	Symptom management, end-of-life	PC team: 2.5 full time equivalent	Location of death, number of emergency room visits with one	Only onco-palliative meeting independently decreases the odds of receiving	<i>Improvement in:</i> <ul style="list-style-type: none"> Less chemotherapy in the last 14 days of life;

2012, France			Follow up no info	care decisions, coping, illness and prognostic understanding, referral and care coordination	physicians, all PC specialists, 2.5 full time equivalent nurses, 1 secretary assistant, 1 attending psychologist	month proceeding death and administration of chemotherapy in the last 14 days of life	chemotherapy in the last 14 days of life and the odds of dying at hospital. Oncologist's awareness in PC and intervention of the PC team did not improve independently any indicators. Among pts seen by PCT, median survival after first contact was longer for pts discussed at onco-palliative meetings than for those not discussed	<ul style="list-style-type: none"> Less likely to die at hospital; Longer median survival. <i>No difference in:</i> <ul style="list-style-type: none"> Oncologist's awareness in PC and intervention of the PC team on any indicators.
Lefkowitz et al.,[11] 2015, USA	6/11	University of Pittsburgh, gynaecological inpatient unit	Gynaecological cancer (100%); Total n=95; Follow up day after PC consultation (D2) and discharge (DLast)	Symptom management	PC team: full-time nurse practitioner, physician and social worker. Part-time services: behavioural health, massage therapy, pet therapy, music therapy	ESAS, PPS	Statistically significant decreases in prevalence of moderate to severe symptom intensity between D1 and DLast for pain, anorexia, fatigue and nausea (magnitude 58-66%; p<0.05) and between D1 and D2 for pain, fatigue and nausea (magnitude 50-55%; p<0.05). No difference on depression (p=0.06)	<i>Improvement in:</i> <ul style="list-style-type: none"> D1 and DLast for pain, anorexia, fatigue and nausea; D1 and D2 for pain, fatigue and nausea. <i>No difference in:</i> <ul style="list-style-type: none"> Depression.
May et al.,[67] 2017, USA	11/11	Mount Sinai Medical Center, Froedtert Hospital of the Medical College of Wisconsin and Virginia Commonwealth University-Massey Cancer Center (n=3)	Cancer (100%); Total n=863	Pain and symptom assessment and treatment, establishment of goals of care and advance care plans, and transition management based on goals of care	PC consultation team: physician, nurse and social worker with the support from other professionals including psychiatry and chaplaincy	Clinical information, characteristic of healthcare utilisation prior to admission, direct cost of admission, and direct costs attributable to specific categories of utilisation	Cost-savings from early PC with an estimated 63% of savings associated with shorter LOS. A reduction in day-to-day costs is observable in the days immediately following initial consult. Comparisons of early and late PC consultation team cost-effects show negligible difference once the intervention is administered	<i>Improvement in:</i> <ul style="list-style-type: none"> Costs from early PC; Day-to-day costs from early PC. <i>No difference in:</i> <ul style="list-style-type: none"> Early and late PC consultation team cost-effects.
May et al.,[18]	10/11	Mount Sinai Medical Center,	Cancer (100%); Total n=969	Identification and treatment of pain and	Palliative Care Consultation Team (PCCT):	Total direct cost of hospital care, health	Earlier PC consultation during hospital admission is associated with lower cost of	<i>Improvement in:</i>

2015, Ireland		Virginia Commonwealth University-Massey Cancer Center, University of Pittsburgh Medical Center, Mount Carmel Health System, Froedtert Hospital of the Medical College of Wisconsin (n=5)		other symptoms, clarifying treatment options, establishing goals of care, and advance plans, and helping pts and families members select treatment that match their goals	no info	system and clinical factors	hospital stay. Intervention within 6 days was estimated to reduce costs by -\$1,312 (p=.04) compared with no intervention and intervention within 2 days by -2,280 (p<.001); these reductions are equivalent to a 14% and a 24% reduction, respectively, in cost of hospital stay	<ul style="list-style-type: none"> Costs of hospital stay when introducing PC early during admission.
Penrod et al.,[54] 2010, USA	6/11	Veterans Affairs hospitals (n=5)	Cancer (62% and 16%) and non-cancer (38% and 84%); Total n=3321	Meeting with pts and/or families and the medical team to establish goals of care and treatments that are concordant with the goals, including lower intensity treatments	PC consultation teams: No info	Direct costs of hospital care, direct costs for laboratory, pharmacy, radiology, nursing, surgery, ICU admission and ICU length of stay	The average daily total direct hospital costs were lower for pts receiving PC compared to usual care (p<0.001). PC pts were 43.7% points less likely to be admitted to ICU during the hospitalisation than usual care pts (p<0.001)	<i>Improvement in:</i> <ul style="list-style-type: none"> Daily total direct hospital costs; ICU admission of PC pts (43.7% less likely).
Roza et al.,[44] 2015, USA	6/8	Mount Sinai Medical Center	Family members (100%); n=108	Providing consultation and offering intensive specialist-level	PC consultation services and PC unit team: PC attending physician, and fellow, nurse	Bereaved Family Survey on satisfaction and patient care	Family member of those who died in the PC unit were more likely to report that their loved one's end-of-life medical care was "excellent". They also reported greater satisfaction	<i>Improvement in:</i> <ul style="list-style-type: none"> Patients end-of-life medical care according to family members;

				symptom control and supportive care for patients and families	practitioner, social worker and chaplain.		with emotional support before the patient's death. No difference was found between the consultation service and usual care.	<ul style="list-style-type: none"> Satisfaction with emotional support before the patient's death. <i>No difference in:</i> <ul style="list-style-type: none"> Consultation service and usual care.
Historical cohort studies								
Bruera et al.,[36] 1989, Canada	6/11	Cross Cancer Institute, Department of Medicine	Cancer (100%); Total n=200; Follow up 3 years	Pharmacologic and non-pharmacologic treatments for cancer pain and other symptoms	Pain and Symptom Control Team (PSCT): 2 physicians, 1 service nurse, 1 or 2 research nurse	Reasons for admission, type of pain, information on narcotics, medication for pain, different consultations, and pain control	The pattern of prescription of narcotics by the residents changed significantly during a last 4 weeks of rotation as compared to the first 4 weeks. However, in several areas of treatment the impact of pain and symptom control team remained minimal	<i>Improvement in:</i> <ul style="list-style-type: none"> Patterns of prescription; Pain.
Centeno et al.,[62] 2009, Spain	6/11	Clinica Universidad de Navarra, Oncology and other department	Cancer (100%); Total n=no info; Follow up 3 years	Prescription of different amount and type of opioids (oral and parenteral morphine, oral and parenteral methadone, oxycodone, and transdermal fentanyl)	PC consultation team (PCCT): two doctors, two nurses, a psychologist and a researcher.	Calculation of defined daily dose for opioid and its administration rout	Implementation of a PCCT in hospital is associated with a higher and more adequate use of opioids	<i>Improvement in:</i> <ul style="list-style-type: none"> Opioid use.
Edmonds et al.,[37] 1998, UK	7/11	St. George's Hospital	Cancer (92%) and non-cancer (8%); Total n=352; Follow up twice weekly	Symptom management	PC team: two full-time clinical nurse specialist and two part-time doctors	E-STAS	Statistically significant improvements in the mean E-STAS score for all symptoms except depression	<i>Improvement in:</i> <ul style="list-style-type: none"> Pain; Other symptoms; <i>No difference in:</i> <ul style="list-style-type: none"> Depression.
Monteleoni et al.,[65] 2004, USA	6/11	Lenox Hill Hospital	Dementia (100%); Total n=85;	Chart review, pt evaluation, communication with attending physician to determine 1. prognosis; 2.	PC consulting team: director of geriatrics, medical residents, ethics and pain consult service staff	Main measured were: number of feeding tubes placed in pts with dementia, plus capable of taking food by mouth, plus with an advanced directive stating they wish to	After the interventions, the number of feeding tubes placed in pts with dementia decreased significantly. But the proportion of tubes placed in pts with an advanced directives refusing artificial	<i>Improvement in:</i> <ul style="list-style-type: none"> Number of feeding tubes placed in pts. <i>No difference in:</i> <ul style="list-style-type: none"> Proportion of tubes placed in pts with an advanced directives

				pts capacity for making decisions; 3. pts wishes; Educational programmes		forgo artificial nutrition and hydration	nutrition was not significantly reduced	refusing artificial nutrition.
Pan et al.,[55] 2015, USA	6/11	Community teaching hospital	Non-cancer (100%); Total n=790; Follow up 2 years before and 2 y after PC program	Discussion with pts and families about tracheostomy; their proper selection for elective tracheostomy	PC team: No info	Difference in tracheostomy rates before and after the PC consult service was formed, in-hospital mortality, LOS and discharge status	Patients who underwent tracheostomy after a PC service was established had less incidence of comorbid disease (p=0.025), lower inpatient mortality (p=0.009), greater discharge to home or rehabilitation (p=0.01) and lower rates of palliative weaning from mechanical ventilation (p<0.001)	<i>Improvement in:</i> <ul style="list-style-type: none"> • Incidence of comorbid disease; • Inpatient mortality; • Discharge to home or rehabilitation; • Palliative weaning from mechanical ventilation.
Case-control studies								
O'Mahony et al.,[69] 2017, USA	8/11	Montefiore Medical Center (MMC) and Rush University Medical Center (n=2)	Cancer (44% and 31%) and non-cancer (56% and 69%); Total n=275; Follow up 6 months before and 6 months after implementation of the program	Symptom management, implementation of a plan of medical care that was developed in a shared decision-making process by the families, pts, PC team, and ICU team	PM team: MMC – PM physician, PM advanced practice nurse and PC social worker; Rush University Medical Center – PC physician, and PM nurse practitioner	Evaluation of association between the use of a PC consultation service programme and hospital costs	Hospital nonroom and board costs at MMC were significantly lower for pts with PC compared with those who did not receive PC (p<.001). Cost differences for ICU pts with and without PC at Rush University Medical Center were not significantly different	<i>Improvement in:</i> <ul style="list-style-type: none"> • Hospital nonroom and board costs at MMC. <i>No difference in:</i> <ul style="list-style-type: none"> • Costs for ICU pts with and without PC at Rush University Medical Center.
Whitford et al.,[57] 2013, USA	9/11	Mayo Clinic's hospitals: Saint Mary's and Rochester Methodist (n=2)	Cancer and non-cancer; Total n=5901; Follow up first 5 years	Patient evaluation, symptom management and discussion on goals of care including prognosis	PC consult service team: palliative medicine board-certified physician, PC nurse and chaplain	OCHEUD	PC consultation services are associated with lower costs and increased referral for post hospital services	<i>Improvement in:</i> <ul style="list-style-type: none"> • Costs; • Referral for post hospital services.
Before-and-after studies								
Bischoff et al.,[51]	9/11	Academic and	Cancer and non-cancer	Identification of advanced	Inpatient PC teams: no info	The 23-item PCQN core data set: patient	PC teams identified care planning needs in 72.2% of	<i>Improvement in:</i>

2018, USA		community US hospitals in the Palliative Care Quality Network (PCQN) (n=78)	(no info on per cent); Total n=73 145; Follow up: median 3 days	care planning needs, goals of care discussions, and assessment and management of pain, dyspnea, nausea, and anxiety		demographics, reason for consultation, needs identified by PC teams, Advanced Care Planning activities and clinical outcomes	the pts. 37.4% of them elected to change their code status. Pts indicated that a status of do not resuscitate/do not intubate was consistent with their goals (32% pre-consultation to 63% post-consultation). However, an advance directive was completed for just 3% and a Physicians Orders for Life-Sustaining Treatment form was completed for 12.3%	<ul style="list-style-type: none"> • Identification of care planning needs; • Identification of surrogates; • Updating information on pts preferences on life-sustaining treatment. <p><i>No difference:</i></p> <ul style="list-style-type: none"> • Legal forms to document pt care preferences.
Braithe et al.,[38] 2007, USA	6/11	M.D. Anderson Cancer Center	Cancer (100%); Total n=61; Follow up 24h, 72h and until disposition	Symptom assessment, alcoholism screening, mental examination and making recommendations for interventions (imaging, counseling, or changing opioids or other medications) as well as patients' outcomes (clinical status within 24 hours, clinical status within 72 hours, and disposition)	PC mobile team: 1 physician, 1 fellow, and 1 advanced practice nurse	ESAS, CAGE questionnaire for alcoholism, MMSE, interventions recommended by mobile team and pts outcomes	28% of the pts showed symptom improvement within 24 hours and 38% within 72 hours. The mobile team had a positive impact on these pts care in terms of clinical finding and outcomes	<p><i>Improvement in:</i></p> <ul style="list-style-type: none"> • Pain; • Depression; • Other symptoms.
Braus et al.,[48] 2016, USA	9/11	Academic Medical Center, Intensive Care Unit	Cancer (12%) and non-cancer (88%); Total n=203; Family members	Proactive PC rounding intervention: PC clinician interacting with ICU	PC consultation team: PC clinician, PC clinical nurse specialist,	ICU and hospital LOS, discharge diagnosis and destination, occurrence of PC consultation, FS-ICU,	Proactive PC intervention was associated with more and earlier ICU family meetings (p=0.01) and shorter hospital LOS (p<0.001). No difference was observed between family	<p><i>Improvement in:</i></p> <ul style="list-style-type: none"> • ICU family meetings (more and earlier); • Shorter hospital LOS. <p><i>No difference in:</i></p>

			n=120; Follow up 3 months	physician on daily rounds suggesting to address PC needs, e.g. recommendations on interdisciplinary family meetings	palliative medicine fellow	PHQ-8, PTSD PCL-C and QODD-1	satisfaction, family psychological symptoms, or family-rated quality of dying	<ul style="list-style-type: none"> Family satisfaction; Family psychological symptoms; Family-rated quality of dying.
Campbell et al.,[63] 1991, USA	5/11	Detroit Receiving Hospital	Cancer (16%) and Non-cancer (84%); Total n=131; Follow up no info	Comprehensive therapeutic plan on symptoms (pain, dyspnea, fever, anxiety) and anticipatory grieve with collaborative interventions (e.g. elimination procedures, music therapy, oxygen, antipyretics, chaplain referral, grief counselling, family support group)	Comprehensive Supportive Care Team (CSCT): Clinical nurse specialist, staff physician, chaplain, social worker, respiratory therapist and the pts primary nurse	TISS	A reduction in scores of TISS after CSCT intervention (p<0.001). Pts with intervention were transferred to general medical wards, which reduces hospital bed and board costs	<i>Improvement in:</i> <ul style="list-style-type: none"> Elimination of unnecessary interventions at the end of life; Hospital bed and board costs (reduction).
Chong et al.,[60] 2004, USA	5/11	Veterans Affairs Medical Center (VAMC)	Cancer (72%) and non-cancer (28%); Total n=100; No info about follow up	Providing specific care recommendations for patients: advance directives, discharge planning, pain management,	Hospital-based interdisciplinary PCT: several physicians, an advanced-practice nurse, a chaplain, a social worker, and rotating PC fellows,	Prevalence of 5 types of recommendations made by PCT and implementation rate by primary physician: 1. Advance directives 2. Discharge planning 3. Pain management 4. Symptom management 5.	The average number of recommendations per pt was 2.84 and 84% were implemented. The most frequent was discharge plans.	<i>Improvement in:</i> <ul style="list-style-type: none"> Recommendation rate; Rate of implementation of the recommendations.

				symptom management, and consultation orders for other services	residents, medical students	Consultation orders for other services		
de Santiago et al.,[13] 2012, Spain	6/11	Clinica Universidad de Navarra	Cancer (n=100); Total n=392; Follow up 1 week	Symptom management	PC consultation team (PCCT): No info	ESAS	A statistically significant decrease was observed for pain, nausea, depression, anxiety, and somnolence as well as in number of uncontrolled symptoms and in the symptom distress score	<i>Improvement in:</i> <ul style="list-style-type: none"> • Pain; • Depression; • Other symptoms; • Symptom distress score; • Number of symptoms with moderate or severe intensity.
Delgado-Guay et al.,[39] 2009, USA	4/11	University of Texas M.D. Anderson Cancer Center	Cancer (100%); Total n=88; Follow up till discharge or death	Providing pharmacological and non-pharmacological recommendations for symptoms, participated in do not resuscitate conversion and withdrawal of mechanical ventilation and bilevel positive airway pressure	PC team: PC physician, PC and oncology fellows, advanced practice nurse, a social worker, a case manager, a child-life specialist and a psychiatric nurse counsellor	ESAS, MDAS, presence of advanced directives	Improvement was reported in pain (90%), dyspnea (90%), anxiety (80%), and delirium (44%). Improvement was seen for participation in do not resuscitate conversion, withdraw of mechanical ventilation and bilevel positive airway pressure	<i>Improvement in:</i> <ul style="list-style-type: none"> • Pain; • Other symptoms; • Participation in do not resuscitate conversion, withdraw of mechanical ventilation and bilevel positive airway pressure.
Ellershaw et al.,[40] 1995, UK	8/11	King's College Hospital	Cancer (100%); Total n=125; follow up twice weekly (for two weeks) until discharge	Pharmacological interventions for symptom control, insight of pts and relatives regarding the diagnosis and placement	Advisory PC team: doctors and nursing sisters	Semi-structured interview/questionnaire on symptom control for patients, observer questionnaire on insight of patients and relatives, interview on placement, and Palliative Care	Statistically significant improvement was observed for pain (p<0.001), nausea (p<0.009), insomnia (p<0.004), anorexia (p<0.001) and constipation (p<0.02). Discussion regarding diagnosis significantly changed the insight of pts (p<0.001) and relatives	<i>Improvement in:</i> <ul style="list-style-type: none"> • Pain; • Other symptoms; • Insight of patients and relatives understanding of diagnosis; • Appropriate placement of the patient.

						Assessment Tool (PACA)	(p<0.02). Appropriate placement was assisted by interventions undertaken by the team	
Iwase et al.,[41] 2007, Japan	7/11	University of Tokyo Hospital	Cancer (100%); Total n=217; Follow up every week until discharge	Medical control of physical symptoms	PC team: 1 PC physician, 1 psycho-oncologist, and 1 cancer care nurse	STAS	Difference between first and last consultation was statistically significant in the mean STAS scores for pain (p<.001), nausea (p<.001), vomiting (p<.009) and breathlessness (p<.008)	<i>Improvement in:</i> <ul style="list-style-type: none"> Pain, nausea, vomiting, breathlessness, and cough. <i>No difference in:</i> <ul style="list-style-type: none"> Mouth dryness, anorexia, constipation, diarrhoea, fatigue, and ascites.
Kao et al.,[52] 2014, China	8/11	Chang Gung Memorial Hospital	Cancer (100%); Total n=2020; Follow up weekly until service termination	Distress management, promotion of disease awareness and awareness about "Do not resuscitate" (DNR) designation	Interdisciplinary PC team: physicians, specialist nurses, social workers, a Buddhist spiritual consultant and volunteers	Relationship of demographics, performance status, physical symptoms, PPI, and interval from PC referral to death with the outcome of DNR designation	64.4% of pts who were not designated DNR at the beginning had a DNR designation at the end of PCCS care. The long duration of care by PC consultation service was significantly associated with DNR designation	<i>Improvement in:</i> <ul style="list-style-type: none"> DNR designation.
Manfredi et al.,[61] 2000, USA	6/11	Academic teaching hospital	Cancer (57%) and non-cancer (43%); Total n=325; Follow up until day of discharge or death	Providing recommendations (e.g. goals of care, advanced directives, foregoing treatment, support, discharge planning)	Palliative Care Service (PCS) team: physician, nurse, rotating residents, fellows, medical students (hospital house staff, nurses, social workers and clergy may be involved)	Six recommendations for patients: <ol style="list-style-type: none"> Discussions about prognosis and goals of care Documentation of advanced directives Discussion about foregoing treatment Support Discharge planning Symptom management 	The average number of recommendations was 4.2 per patient and 91% of the recommendations were implemented. Recommendations increased to 5.3 per pt and implementation rate increased to 97% for 44 pts transferred to the palliative care unit. PCS consultations result in multiple recommendations with a very high implementation rate	<i>Improvement in:</i> <ul style="list-style-type: none"> Implementation rate of recommendations.
McQuillan et al.,[20] 1996, USA	6/11	University Hospital of Wales (UHW)	Cancer (92%) and HIV (8%); Total n=324; follow-up at 6	Development of information leaflets for pts, PC	A registrar in palliative medicine, PC physician, part time palliative	Patient rating of symptoms; questionnaire to measure satisfaction	No statistically significant changes were observed in symptoms. There was a significantly increased use of appropriate opioid analgesics	<i>Improvement in:</i> <ul style="list-style-type: none"> Use of appropriate opioid analgesics and NSAIDs; Staff satisfaction with the survey;

			weeks and 1 year	guidelines for staff and education programs for pharmacists	care pharmacist and nurses	with the service by the staff	and NSAIDs. Staff were satisfied with the survey	<i>No difference in:</i> <ul style="list-style-type: none"> • Pain; • Other symptoms.
Morrison et al.,[49] 2011, USA	8/11	New York State hospitals (n=4)	Cancer (54%) and non-cancer (46%). Total n=2051; Follow up until discharge alive or death	Palliative Care Consultation Teams assisted patients, families, and referring teams in clarifying diagnoses, treatment options, goals of care, and hospital discharge options	Hospital A: 1 physician, 1 nurse practitioner Hospital B: 1.6 physicians, 2 nurse practitioners, 0.2 social worker, 0.2 psychologist Hospital C: 1 physician, 1 nurse practitioner, 1 social worker Hospital D: 2 physicians, 2 nurse practitioners, 2 social workers	Total costs for each subject for each hospital day and for the entire admission period. Average daily total costs ICU LOS in days. Likelihood of discharge to hospice or death in the ICU	PC was associated with an average reduction in total cost of \$4,098 per admission. Compared with usual-care patients, PC patients were significantly more likely to receive hospice care in an appropriate setting (home, nursing home, or inpatient hospice) after hospital discharge (30% vs. 1%). No statistically significant differences in average hospital LOS or average ICU LOS were noted between usual-care patients and PC patients	<i>Improvement in:</i> <ul style="list-style-type: none"> • Overall hospital costs; • Receiving hospice care in appropriate setting after discharge; <i>No difference in:</i> <ul style="list-style-type: none"> • Average hospital LOS or average ICU LOS.
Mun et al.,[53] 2018, USA	8/11	Kaiser Permanente Medical Center in Hawaii	Non-cancer (100%); Total n=392; Follow up 3 months	Quality improvement program including selecting trigger criteria, a care model, forming guidelines, and developing evaluation criteria	In-patient PC team: board-certified physician, a registered nurse, a social worker, and a chaplain	Early identification of the multiple features of advanced care planning, number of proactive ICU PC family meetings, and changes in code status and treatment upon completion of either meeting	Early identification of Goal-of-Care, advance directives, and code status by the ICU staff led to a proactive ICU family meeting with resultant increases in changes in code status and treatment	<i>Improvement in:</i> <ul style="list-style-type: none"> • Early identification of Goal-of-Care, advance directives, and code status; • Conducting ICU family meetings; • Code status change and treatment.
O'Mahony et al.,[28] 2005, USA	5/11 (Retro spect	Montefiore Medical Centre (MMC)	Cancer and non-cancer; Patients (N=592) and	Providing recommendations for interventions	PC service: 3 PC physicians, 2 specialist nurse practitioners, 2	Chart abstraction tool, caregivers satisfaction (telephone survey), satisfaction of	Pain and other symptoms improved in 87% of patients. 95% caregivers described themselves as likely to	<i>Improvement in:</i> <ul style="list-style-type: none"> • Pain; • Other symptoms;

	ive); 3/11 (Eco nomi c eval ation)		caregivers (n=55); follow up: no info	such as pain and symptom management, advance care and discharge planning	social workers and a personal care worker	referring physician (Likert-scale), and cost reduction analysis	recommend the service to others. Providers' satisfaction were evidenced and an increase in the rate of referral for PC consultation from 2- 21% of all pts. There was significant reduction in charges. LOS was significantly reduced for pts referred to hospice	<ul style="list-style-type: none"> Caregivers recommending the service to others; Providers' satisfaction and rate of referral for PC consultation; Charge reduction; LOS reduction in pts referred to hospice.
Penrod et al.,[59] 2011, USA	6/11	Veterans Integrated Service Network, Department of Veterans Affairs' ICU (n=3)	Cancer (8%) and non-cancer (92%); Total n=415; Follow up 5 days	Critical care and PC providers trained ICU nurse teams to improve care through auditing, performance feedback, improvement tools, education and monthly team meetings	Intervention leaders: Physician specialist in oncology and palliative medicine and advanced practice PC nurse	Percent of ICU pts with lengths of stay of 5 or more days that received the care process by the appropriate day	Offering social work (p<0.001) and spiritual support (p=0.05), identification of the medical decision maker (p=0.02) and documentation of family meetings (p=0.04) significantly improved	<i>Improvement in:</i> <ul style="list-style-type: none"> Offering social work and spiritual support; Identification of the medical decision maker; Documentation of family meetings.
Sasahara et al.,[43] 2010, Japan	7/11	Showa University Hospital	Cancer patients (100%) and nurses (n=98); Patients n=53; Follow up on days 7, 14 and 28	Advice on symptom management, emotional support for patient and family and care transitions	Specialised PC consultation team: PC physician, nurse, psychiatrist, social worker, link nurses and pharmacists	Number of categories of support provided by the PC team. Improvement in symptoms as measured by the STAS-J and EORTC QLQ-C30. Questionnaire for primary nurses	Only insomnia improved significantly (p<.01) whereas „other physical symptoms” (p<.01) and constipation were significantly exacerbated (p<.05). No difference in any functional scales. Staff survey showed positive evaluation of the effect of PC team on provided support	<i>Improvement in:</i> <ul style="list-style-type: none"> Insomnia; Staff perception on provided support by PC team; <i>No difference in:</i> <ul style="list-style-type: none"> Pain; Depression; Other symptoms; Functional scales.
Selwyn et al.,[15] 2003, USA	7/11	Montefiore Medical Center	HIV/AIDS (100%); Total n=132; follow-up until discharge or death	Pain and symptom management, advanced care planning, goals of care, psychosocial concerns, pastoral care,	Multidisciplinary HIV PC team: physician, nurse practitioner, social worker, chaplain, outreach worker,	MSAS, MMSE, KPS, RDRS	Successfully resolved problems were psychosocial issues (91%), pain (90%), nausea/vomiting (90%); less successful problems included memory problems/dementia (26%), fatigue/weakness (66%) and depression (68%)	<i>Improvement in:</i> <ul style="list-style-type: none"> Psychosocial issues; Pain; Depression; Other symptoms; Memory problems/dementia.

				legal-ethical concerns	psychiatrist and ethicist			
Souza et al.,[64] 2016, Brazil	6/11	Instituto de Infectologia Emilio Ribas	HIV/AIDS (100%); Total n=109;	Management of symptoms and support for the family	PC team: 2 doctors, 2 nurses, 1 nursing assistant, 2 social workers, 1 occupational therapist, 1 nutritionist, and 3 chaplains	Underling disease, HIV/AIDS status, reasons for hospitalisation, requests for PC consultation	The number of potentially inappropriate interventions significantly decrease: antiviral therapy (p=0.02), antibiotics (p<0.001), vasoactive drugs (p=0.009), renal replacement therapy (p<0.0001) blood product transfusions (p<0.0001)	<i>Improvement in:</i> <ul style="list-style-type: none"> • Prescription of potentially inappropriate interventions: <ul style="list-style-type: none"> - Antiviral therapy - Antibiotics; - Vasoactive drugs; - Renal replacement therapy; - Blood product transfusions.
Starks et al.,[70] 2013, USA	8/11	Academic medical centres (n=2)	Cancer and non-cancer (n=3605)	a. primary attending team mitting with pt and family and making recommendati on; b. taking primary attending role for pts who did not have a community primary care provider to follow them in community	Hospital 1: 0.5 FTE divided across four physicians, 0.8 FTE chaplain resident, 1.0 FTE nurse practitioner. Hospital 2: 1.0 FTE nurse practitioner, 0.25 FTE physician.	Cost differences for length of stay of 1 to 7 days, 8 to 30 days and >30 days. Comparison for all patients in both hospitals and by discharge disposition: survivors and decedents	Significant savings per admission were associated with shorter LOS. For stay of 8-30 days, costs were lower for all PC pts and survivors. Patients with stays >30 days showed no difference	<i>Improvement in:</i> <ul style="list-style-type: none"> • Cost savings per admission at shorter LOS; <i>No difference in:</i> <ul style="list-style-type: none"> • Patients with stays >30 days.
Virik et al.,[58] 2002, USA	5/11	Westmead Hospital	Cancer (80%) and non-cancer (20%); Total n=50; Follow up: discharge or pt death	Pharmacologi cal, non-pharmacologi cal recommendati ons, clarification of goals of treatment, and referral	1 full-time physician specialising in PM, a part-time family physician with PC expertise, a resident, and a clinical nurse specialist	Referral patterns, reasons for consultation, advice given; Pt recommendation were measured by 4-point scoring system	Advice was given regarding discharge planning (62%) which was judged by referring team to have the highest positive impact of all recommendations. 74% were graded by the referring team as having at least one recommendation with a positive impact (p=0.02). The LCS is perceived to have a positive impact on pt care in an acute hospital setting	<i>Improvement in:</i> <ul style="list-style-type: none"> • Patient care in an acute hospital setting: <ul style="list-style-type: none"> - Giving advice on discharge planning; - Referring team' grading the recommendations provided by team as positive.
Cross-sectional study								

Thygeson et al.,[56] 2016, USA	7/11	General acute care hospitals from California Office of State-wide Health Planning and Development (n=203)	Chronically ill (100%); n=no info	Patients receiving California hospital-based PC programs: no detailed info about intervention	Interdisciplinary PC-certified team: nurse, physician, social worker, chaplain	Hospital days, ICU days, physician visits in the last 6 months of life, and percentage of inpatient death	Among non-profit hospitals, small size or large size and having an inpatient PC programme with more than 3 PC staff per 100 GMS beds, or an interdisciplinary PC-certified team, was associated with significantly lower end-of-life hospital utilisation and percentage of deaths occurring in the inpatient setting	<i>Improvement in:</i> <ul style="list-style-type: none"> End-of-life hospital utilisation Percentage of deaths.
Mixed methods study								
Hartwig et al.,[42] 2013, Tanzania	7/11 for quantitative; 8/10 for qualitative	Evangelical Lutheran Church in Tanzania hospitals (n=13)	Cancer (100%); n=145 and nurses n=6; Follow up 4 visits	Pain management without access to morphine	PC team: clinician and nurse	The APCA African GMS and interview with nurses	Patients and their family caregivers identified statistically significant (p<0.001) improvements in pain management and quality of care. Thematic analysis of nurses described the pt and family benefits from PC but also their distress when 'bad cases' arose	<i>Improvement for pts and caregivers in:</i> <ul style="list-style-type: none"> Pain; Quality of care/satisfaction with care; <i>Nurses perceptions:</i> <ul style="list-style-type: none"> Patient and family benefits from PC; Distress when 'bad cases' arose.
Qualitative studies								
Enguidanos et al.,[17] 2016, USA	7/10	Community hospital	Family members (100%); n=23	Palliative care consultation to patients and their family members including pain management, communication, and providing easy access to other professionals	Inpatient PC consultation team: 3 physicians, a nurse practitioner and social worker	Subjective feelings of family members and opinions regarding the quality of health-care service	Family members expressed positive aspects of the team (pain control and communication), increased access to medical professionals and time to discuss patient conditions. Some themes reflected a lack of adequate preparation for the inpatient PC consultation and readiness for discussing prognosis.	<i>Caregivers perception on Improvement in:</i> <ul style="list-style-type: none"> Pain control; Communication; Increased access to medical professionals; Time to discuss patient conditions. <i>No difference in:</i> <ul style="list-style-type: none"> Adequate preparation for the inpatient PC consultation; Readiness for discussing prognosis.
Yang et al.,[45] 2012, UK	8/10	Acute Hospital	Cancer (100%); n=12 and carers n=10	Symptom control, provision of psychological support,	Multidisciplinary hospital PC team: Consultants in palliative	Semi-structured interviews: reasons of pt/carer referral and previous contact; views of using the	Patients and carers developed an understanding of their role which they saw as three-fold: physical symptom control, psychological support and a	<i>Improvement in:</i> <ul style="list-style-type: none"> Patients and carers understanding of their role;

				identification of social problems, discussion on spiritual and ethical issues	medicine (1 full-time, 1 part-time), associate specialist in palliative medicine (1 part-time), specialist registrars (2 part-time) and administrative staff (2 part-time)	service; and impact on the pt/carer on symptom control and psychological problems	reliable liaison. The interview themes was that the PC team made time for pts, giving them a sense of value and worth. Feeling their care a priority and being listened to make PC input effective	<ul style="list-style-type: none"> • Time spent with pts (giving them a sense of value and worth); • Understanding that their care is a priority; • Understanding being listened to make PC input effective.
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PCT = Palliative Care Team; pts = patients; HADS = Hospital Anxiety and Depression Scale; IES-R = Impact of Events Scale-Revised; ICU = Intensive Care Unit; ACP = Advanced Care Planning; IPCS = Interdisciplinary Palliative Care Service; MCOHPQ = Modified City of Hope Patient Questionnaire; EORTC QLQ C30 = European Organization for Research and Treatment of Cancer Quality of Life Questionnaire C30; VAS = Visual Analogue Scale; MPAC = Memorial Pain Assessment Card; WONCA scale = Dartmouth COOP functional health assessment Charts/WONCA; HRQoL = Health Related Quality of Life; PHQ-9 = Patient Health Questionnaire -9; MLHF = Minnesota Living with Heart Failure; ESAS = Edmonton Symptom Assessment Scale; QOL = quality of life; COPD = Chronic Obstructive Pulmonary Disease; SPCT = Specialised Palliative Care Team; SGRQ = St George respiratory Questionnaire; McGill = McGill Quality of Life Questionnaire; PACA = Palliative Care Assessment Tool; SDS = Symptom Distress Scale; SWBS = Spiritual Well-Being Scale; SSS = Social Support Scale; PCCT = Palliative Care Consult Team; LOS = length of stay; MICU = Medical Intensive Care Unit; PPS = Palliative Performance Scale; PSCT = Palliative Service Consult Team; E-STAS = Extended version of Support Team Assessment Schedule; OCHEUD = Olmsted Country Healthcare Expenditure and Utilisation Database; PCQN = Palliative Care Quality Network; CAGE = Questionnaire for alcoholism; MMSE = Mini Mental State Examination; FS-ICU = Family Satisfaction in the Intensive Care Unit; PHQ-8 = Patient Health Questionnaire – 8; PTSD PCL-C = Post-Traumatic Stress Disorder Checklist-Civilian; QODD-1 = Quality Of Death and Dying; CSCT = Comprehensive Supportive Care Team; TISS = Therapeutic Intervention Scoring System; MDAS = Memorial Delirium Assessment Scale; STAS = Support Team Assessment Schedule; PPI = Palliative Prognostic Index; DNR = Do Not Resuscitate; PCS = Palliative Care Service; NSAIDs = Nonsteroidal anti-inflammatory drugs; STAS-J = Team Assessment Schedule-Japanese; MSAS = Memorial Symptom Assessment Scale; KPS = Karnofsky Performance Scale; RDRS = Rapid Disability Rating Scale; FTE = full-time equivalent; LCS = Liaison Consultation Service; GMS = General Medical-surgical Service; APCA African POS = African Palliative Outcome Scale;