

Additional file 4: Systematic review themes and subthemes

Themes	Subthemes	Explanatory Narrative
Theme 1: Motivating factors that trigger learning in end-of-life care	Disposition to provide palliative care	Positive attitude towards helping palliative patients(Slort et al, 2011 [44]) Rhee et al, 2018 [47]) (Jhonston et al, 2001 [57] , Rhee et al., 2018 [47]), Comfort in providing palliative care (Rhee et al., 2018 [47]), Being humane to patient's concern(O'Connor et al, 2014 [40]), improve quality of life of palliative patients (O'Connor et al, 2006 [39]), more experience and higher clientele (Barclay et al, 2003 [51]) (Rhee et al, 2008 [46]) (Junger et al, 2010 [57]), older GPs are able to focus on their interest areas have more older and sicker patients(Barclay et al, 2003 [51]), GPs with experience in home care would prefer learning palliative care(Barclay et al, 2003 [51]) (Jhonston et al, 2001 [57]) (Slort et al, 2011 [44])
	Self-actualisation	Palliative care as valuable part of their care(Meijler et al, 2005 [48])(Lloyd-William et al, 2006 [56]) (Hermann et al, 2019 [38]) (Junger et al, 2010 [49]), intuition that they will be able to help the dying patient(Junger et al, 2010 [49]), Need for an attitudinal shift from “cure to care” in order to look beyond the usual framework of a diagnosis, a therapy and making somebody better (Pype et al, 2014 (a) [25]), training in palliative care helps become a good physician(Meijler et al, 2005 [48]), Recourse to guilt from previous failures to alleviate symptoms(O'Connor et al, 2006 [39]), Feeling and understanding that personal loss helps empathize with patients better(O'Connor et al, 2014 [40]), need for coping with powerlessness, helplessness and emotional burden of caring(Selman et al, 2017 [24]) (Hermann et al, 2019 [38]) (Meijler et al, 2005 [48])
	Relevance to clinical practice	GPs trained with specialists if they felt the specialists had the skills and preference relevant to their practice(Shipman et al, 2002 [54]) (Ability to deal with)Complexity of end of life care(Selman et al, 2017 [24]) Deficiency in knowledge and skills(Barclay et al, 2003 [51]) Fear of treading unknown territory(Taubert et al, 2011 [45]) Confidence in prescribing analgesia triggers more learning(Shipman et al, 2001 [53]) Attrition of skills over time(Selman et al, 2017 [24])(Pype et al, 2014 (b) [26]) due to lack of ongoing exposure to palliative care patients or due to referral to specialists or GP colleague with interest(Selman et al, 2017 [24]) Lack of expertise in addressing specific aspects such as spiritual and religious concerns (Assing Hvidt et al. 2016 [41])
	Feeling responsible	Generalist must be specialists in EOLC(Selman et al, 2017 [24]) Central to coordinating palliative care for patients in the community (Lloyd-William et al, 2006 [56]) Feel committed to caring for their patients as a trusted key person who accompanies the family for many years (Junger et al, 2010 [49]) Feeling palliative care as their core responsibility (Pype et al, 2014 (a) [25]) (O'Connor et al, 2006 [39])

		Responsible for keeping patients free of pain and discomfort(Pype et al, 2014 (b) [26]) Sense of responsibility to support bereaved family (O'Connor et al, 2014 [38])
	Therapeutic bond	Providing care for a prolonged period for patients (Barcley et al, 2003 [51]) (Shipman et al, 2001 [53]) (Rhee et al, 2018 [47]) from birth to end-of-life (Junger et al, 2010 [49]) or from diagnosis to end-of-life(O'Connor et al, 2006 [39]) and for patients known to them in the past(Rhee et al, 2018 [47]) (O'Connor et al, 2006 [39]) eases palliative care provision(Rhee et al, 2018 [47]) Strong bond that developed with long standing patient-GP relationship(Slort et al, 2011 [44]) (Shipman et al, 2001 [53]) (O'Connor et al, 2014 [40]) (Rhee et al, 2008 [46]) (Rhee et al, 2018 [47]) (Pype et al, 2014 (a)[25]) (Lloyd-William et al, 2006 [56]) (Hermann et al, 2019 [38]) leads to better awareness of palliative care needs of the patients(Shipman et al, 2001 [53]) Awareness of social and family background helps address patient's needs better(O'Connor et al, 2006 [39] , Connor et al, 2014[40]) They believed in helping a patient as a whole person and not as a disease entity (Junger et al., 2010 [49]) and felt the need to address the complex sufferings of patients while honoring their dignity, expectations, and wishes (Slort et al., 2011 [44]) (Assing Hvidt et al., 2016 [41]).

Themes	Subthemes	Explanatory Narratives
Theme 2: End-of-life care learning needs	Accessing palliative care	Needs for identification and referral for palliative care(Selman et al., 2017 [24]) Need for awareness about local specialist services and resources(Selman et al., 2017 [24] , Hermann et al., 2019 [38]) (Junger et al., 2010 [49]), local systems and frameworks for navigation(Selman et al., 2017 [24]) Clarity in roles, responsibilities and teamwork (Selman et al., 2017 [24]) Guidelines on out-of-hours care(Selman et al., 2017[24]) Guidelines for effective planning and provision of EOLC(Rhee et al., 2018 [47]) Guidelines on when to refer to specialists or other resources(O'Connor et al., 2014 [40]) Importance of and how to build a multidisciplinary team(O'Connor et al., 2006 [39])

	<p>Pain and symptom management</p>	<p>Need for training in other symptoms management(Barclay et al., 2003 [51]) (Becker et al., 2010 [42]) (Straatman et al., 2013 [41]) (Shipman et al., 2002 [52], (Pype et al., 2014(b) [26]) (O'Connor et al., 2006 [39]) (Lloyd-Williams et al., 2006[56]) Palliative care emergencies(Magee & Koffman, 2016 [50]) Preference for treating symptoms that they could treat with drugs(Jhonston et al., 2001 [57]) Symptom control in non-malignant conditions(Shipman et al., 2001 [53]) (Magee and Koffman, 2016 [50]) Management of nausea/vomiting(Shipman et al., 2001 [53]) (Meijler et al., 2005 [48]) Management of agitated delirium and complications, dyspnoea(Samaroo et al., 1993 [55]) (Rhee et al., 2008 [46]), Magee and Koffman, 2016 [50], (Meijler et al., 2005 [48]) Management of hypoxia and insomnia(Wakefield et al., 1993 [52], Meijler et al., 2005 [48]) Psychosocial issues of terminally ill patients(Wakefield et al., 1993 [52]) (Rhee et al., 2008 [46]) (Pype et al., 2014(b) [26]) (O'Connor et al., 2006 [39]) (Lloyd-Williams et al., 2006 [56]) and withdrawal symptoms(Samaroo et al., 1993 [55]) Distinguishing adjustment disorder from sadness (Meijler et al., 2005 [48]) Challenges in distinguishing delirium, fear of dying or anxiety(Meijler et al., 2005[48], Jhonston et al., 2001 [57]) Handling the emotional distress of patients such as fear(Slort et al., 2011 [44]) (O'Connor et al., 2006 [39]) anger, demanding behavior (Samaroo et al., 1993 [55]) Need for assessment and provision of nutrition support(Straatman et al., 2013 [43], Meijler et al., 2005 [48]), parenteral/PEG feeding(Meijler et al., 2005 [48]) Other symptoms such as anorexia, fatigue, incontinence, unpleasant smell (Jhonston et al., 2001 [57]) Need for training in addressing spiritual needs of patients(Straatman et al., 2013 [43], Pype et al., 2014(b) [26], Jhonston et al., 2001 [57]) and religion(Pype et al., 2014(b)[26])</p>
	<p>Communication skills and compassionate care</p>	<p>How to facilitate decision making in life limiting conditions(Junger et al., 2010 [49]) Training in breaking bad news to patients/family(Shipman et al., 2001 [53]) (Pype et al., 2014(a) [25]) (O'Connor et al., 2006 [39]) (Meijler et al., 2005 [48]) Communication skills in counselling patients transitioning from curative to palliative care(Meijler et al., 2005 [48]) (Magee & Koffman, 2016 [50]) Skill building in handling difficult conversation especially in time constraints(Selman et al., 2017 [24])</p>

		<p>Challenges of handling troublesome relationship with patients(Slort et al., 2011 [44])</p> <p>Challenges of handling patient-relative conflicts(Slort et al., 2011 [44]) (O'Connor et al., 2006 [39]) (Meijler et al., 2005 [48])</p> <p>Training to deal with resistant patient/family (Selman et al., 2017 [24]) in denial/ bargaining(O'Connor et al., 2006 [39]) (Meijler et al., 2005 [48]) (Hermann et al., 2019 [38])</p> <p>To learn how to use right attitude, diplomacy, skills/tactics to deal with difficult situation with family(O'Connor et al., 2006 [39]), Meijler et al., 2005 [48])</p> <p>Need to understand how to tailor information conveyed to family(O'Connor et al., 2006 [39])</p> <p>To tackle vulnerability and apprehensions related to communication around death and dying (Junger et al., 2010 [49])</p>
	Address caregiver needs	<p>Handling the emotional distress of the relatives(Wakefield et al., 1993 [52]) (Meijler et al., 2005 [48])</p> <p>Bereavement support of caregivers(Wakefield et al., 1993 [52]) (Lloyd-William et al., 2006 [54]) (Jhonston et al., 2001 [57]) (Junger et al., 2010 [49])</p> <p>Need of differentiation between grief reaction and depression(O'Connor et al., 2014 [40])</p> <p>Resolving family's anticipatory grief when in denial(O'Connor et al., 2006 [39])</p>
	Ethical and Medico-legal aspects	<p>To provide care in patient's best interest(Selman et al., 2017 [24]) respecting patient's wishes and expectations(Slort et al., 2011 [44])</p> <p>To understand the ethical norms and values(Meijler et al., 2005 [48])</p> <p>How to discuss ethical aspects of care to patients/family and colleagues(Meijler et al., 2005 [48])</p> <p>Need for training in medicolegal aspects of palliative care(Rhee et al., 2018 [47])</p>
	Teamwork	<p>Sharing of responsibility (Straatman et al., 2013 [43])</p> <p>Debriefing with colleagues(Straatman et al., 2013 [43]) (Junger et al., 2010 [49]) in an emotionally draining situation in practice(Hermann et al., 2019 [38])</p> <p>To develop coping strategies(Becker et al., 2010 [42]) (Junger et al., 2010 [49])</p> <p>To deal with coping in special situation such as loss of children cared for(O'Connor et al., 2006 [39]) or with children of similar age as theirs (O'Connor et al., 2006 [39])</p> <p>For younger GPs who may be still developing their personal views on death and dying(O'Connor et al., 2006 [39])</p> <p>Need for mutual support from multidisciplinary team/specialists(Junger et al., 2010 [49])</p>

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<p>Theme 3: Preference for a learning style</p>	<p>Learning from experience and Experiential learning</p>	<p>Expertise grows with years of experience(Assing Hvidt et al., 2016 [41]) (Selman et al, 2017 [22] (Pype et al., 2014(a) [25]) (O'Connor et al., 2006 [39]) (Lloyd-Williams et al., 2006 [56]) Expertise grows through patient-GP relationship(Assing Hvidt et al., 2016 [41]) (Pype et al., 2014(a) [25]) Real time exposure in the workplace to palliative care helps gain confidence(Rhee et al., 2018 [47]) (Pype et al., 2014(b) [26]) (O'Connor et al, 2014 [40]), Hermann et al., 2019 [38]) Intuition and gut feelings helps address certain areas such as spirituality(Assing Hvidt et al., 2016 [41]) Need for learning through experience in a mentored environment(Selman et al., 2017 [24]) and from experienced general practitioners (Selman et al, 2017 [24]) (Rhee et al, 2018 [47]) (Meijler et al, 2005 [48]) (Magee and Koffman, 2016 [50]) Providing shared care with specialist palliative care team(Selman et al., 2017 [24]) (Rhee et al., 2018 [47]) helps shifts to more proactive style of treating (Pype et al., 2014(a) [25]) Attending planning meetings with specialists(Pype et al, 2014 (a)[25]) Palliative care needs to be integrated into primary care(Rhee et al., 2018 [47]) (Hermann et al., 2019 [38]) Learning from peer from different disciplines (Becker et al., 2010 [42]) (Selman et al., 2017 [24]) (Lloyd-Williams et al., 2006 [56]) (Magee and Koffman, 2016 [50]) Learning from relatives who have gone through caring for palliative patients(Selman et al.,2017 [24]) (Pype et al., 2014(a)[25])</p>
	<p>Pragmatic learning style</p>	<p>Reflection on one's practice under the guidance of specialists(Pype et al. 2014(a) [25]) (Pype et al. 2014(b) [26]) Applying the principles of palliative care in practice and getting feedback(O'Connor et al., 2014 [40]) Learn from one's mistakes and non-success(Taubert et al., 2011 [45]) (Pype et al, 2014(b) [26]) Reflection on one's practice of communication with specialists (Pype et al., 2014 (b) [26]) Hands-on interactional training under a mentor (Selman et al, 2017 [24]) (Hermann et al., 2019 [38]) (Rhee et al , 2018, [47]) Problem-based learning through follow up (Taubert et al., 2011 [45]) (Meijler et al., 2005 [48]) Case-based learning(Junger et al.,2010 [49]) (Pype et al., 2014 (a) [25])(Magee and Koffman, 2016 [50]) through telephonic or face-face contact(Shipman et al., 2002 [54]), Selman et al.,2017 [24]) sometimes also calls for instant discussion considering variability in patient needs (Pype et al., 2014(a) [25]) Cased based discussion with specialists by patient's bedside(Samaroo et al., 1993 [55]) (Rhee et al., 2018 [47]) (Jhonston et al., 2001 [57]) Learning by auditing data(Jhonston et al., 2001 [57])</p>
	<p>Self-learning</p>	<p>Internet based/text book based learning (O'Connor et al., 2006 [39]) (Hermann et al., 2019 [38]) (Straatman et al., 2013 [43]) (Taubert et al., 2011 [45]) (Rhee et al., 2008 [46]) (Magee and Koffman, 2016 [50])</p>

		<p>Computer based learning(Jhonston et al., 2001 [57])</p> <p>Correspondence learning(Straatman et al., 2013 [43])</p> <p>Reference to guidelines(Shipman et al., 2002 [54]) (Samaroo et al., 1993 [55])</p> <p>E-learning as cost effective and flexible(Selman et al., 2017 [24])</p> <p>Self-learning modules(Samaroo et al., 1993 [55]) (Rhee et al., 2008 [46]) (Pype et al., 2014(b) [26]) (O'Connor et al., 2014 [40]) (Junger et al., 2010 [49])</p> <p>Learning by researching(Jhonston et al., 2001 [57])</p>
	Didactic learning	<p>Learning by listening (Junger et al., 2010 [49]) (Lloyd-William et al., 2006 [56]) (Jhonston et al., 2001 [57]) and observing(for topics like team building, religious and psychological topics)(Pype et al., 2014(a) [25]), (O'Connor et al., 2014[40])</p>

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Theme 4: Perceived facilitators of learning	Amicable learning environment	<p>Learning in a respectful environment that will be non-intimidating or non-judgemental (Pype et al, 2014(a) [25]) Learning that happens in a safe and trusted environment(Pype et al, 2014(b) [26]) where mentors are not be reprimanding (Pype et al, 2014 (a) [25]) (Pype et al, 2014 (b)[26])</p> <p>Learning that does not expose their deficiency to their patients(Pype et al, 2014(a) [25])</p>
	Preference for mentor and peer group	<p>Multidisciplinary mentors(Pype et al., 2014(a) [25]) (Lloyd-William et al., 2006 [56]) (Magee and Koffman, 2016 [50]) including GP colleagues(Meijler et al., 2005 [48]) (Magee & Koffman, 2016 [50]) palliative physicians and palliative care nurse(Magee and Koffman, 2016 [50])</p> <p>Small multidisciplinary peer group(Becker et al., 2010 [42]) (Magee and Koffman, 2016 [50]) (Pype et al., 2014(a) [25]) (Hermann et al., 2019 [38])</p>
	Preference for timing of training	<p>Evening courses(Becker et al., 2010 [42])</p> <p>Weekend courses(Becker et al., 2010 [42]) (Straatman et al., 2013 [43])</p> <p>Half day workshop(Samaroo et al., 1993 [55])</p> <p>Quarterly topical in-service training(Samaroo et al., 1993 [55])</p> <p>One day on-site training(Samaroo et al., 1993 [55])</p> <p>Quarterly case rounds(Samaroo et al., 1993 [55])</p> <p>Learning as being ongoing and lifelong(Pype et al., 2014(a) [25]) (Hermann et al., 2019 [38])</p> <p>Out of business hours(Hermann et al., 2019 [38])</p>
	Preference for feedback	<p>Patient and family feedback was most preferred but if done sensitively (Selman et al., 2017 [24]) (O'Connor et al., 2014 [40])</p> <p>Timing of the feedback was important and wanted it filled by familiar face as otherwise they feared low return rates(through posts) (Selman et al., 2017 [24])</p> <p>Apprehension of negative feedback from patient and family (Selman et al., 2017 [24])</p> <p>Preferred to avoid feedback from dying patient or a family as it would cause discomfort to them (Selman et al., 2017 [24])</p> <p>Preferred feedback from specialists (Pype et al. 2014(a) [25])</p> <p>Feedback from members in the team in a trusted environment(Pype et al., 2014(b) [26])</p>

		<p>Behavioural assessment using videotaping or simulation(Selman et al., 2017 [24]) (Jhonston et al., 2001 [57]) was questioned as GPs felt this could be rehearsed</p> <p>Self-assessment forms were considered of limited use although GPs filled it sincerely (Selman et al., 2017 [24])</p> <p>Self-assessment forms were filled if they were not too lengthy(Selman et al., 2017 [24])</p>
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Theme 5:	Subtheme	Explanatory Narratives
Perceived Barriers of Learning		
Dispositional barriers	Diffidence to discuss end of life care	<p>Guilt or hopelessness of not having confidence in caring for dying patient(Junger et al., 2010 [49])</p> <p>Taboo about discussion around death and dying(Assing Hvidt et al, 2016 [41]) (Junger et al, 2010 [49])</p> <p>Fear of causing discomfort to patient and family about aspects such as spirituality and religion(Assing Hvidt et al, 2016 [41])</p> <p>Fear of invading the private space- spiritual space is private to patient/family(Assing Hvidt et al, 2016 [41])</p> <p>Fear of blame or medico-legal recrimination for wrong doing (Taubert et al, 2011 [45]) (Meijler et al, 2005 [48])</p>
Situational barriers	Challenges at an individual level	<p>Younger GPs with less years of experience have less autonomy to focus on specific specialty (Assing Hvidt et al.,2016 [41]) (Barcley et al, 2013 [51]) (Rhee et al, 2008 [46])</p> <p>Insecurity to broach their deficiency in knowledge can inhibit their inclination to learn(Taubert et al, 2011 [45])</p> <p>Lower incidence of palliative care patients results in less motivation of GPs to learn(Shipman et al, 2002 [54]) (Selman et al, 2017 [24])</p> <p>Less sick patients had less palliative care needed(Rhee et al, 2018 [47])</p> <p>Perception of having sufficient knowledge(Shipman et al, 2002 [54]) and no new developments in the field of palliative care(O'Connor et al, 2006 [39]) (O'Connor et al, 2014 [40])</p> <p>Personal/family commitment gives less time to training(Rhee et al, 2008 [46])</p> <p>Care as being emotionally draining(O'Connor et al, 2006 [39])</p>
	Resource constraints	<p>General practitioners felt that there was a lack of systematic or standardised guidelines to help address palliative care needs (Assing Hvidt et al, 2016 [41]) (Hermann et al, 2019 [38]) or knowledge of resources where their patients could be referred for specialised care (Assing Hvidt et al, 2016 [41]). Rural general practitioners or general practitioners who had solo or small practice had less support system that limited their access to training (O'Connor et al, 2006 [37]) (Shipman et al, 2001 [53]) (Junger et al, 2010 [49]) (Barcley et al, 2003 [51])</p>
Professional barriers	Challenges at professional level	<p>Excess work pressure with resultant lack of time as a constraint to learning(Shipman et al, 2002 [53]) (Assing Hvidt et al, 2016 [41]) (Rhee et al, 2008 [46]) (Pype et al, 2014(a) [25]) (Jhonston et al, 2001 [57]) (Hermann, et al, 2019 [38]) (Selman et al, 2017 [24]) (O'Connor et al, 2006 [39]) (Meijler et al, 2005 [48])</p>

		<p>Remuneration incommensurate with the work done(Rhee et al, 2008 [46]) (Hermann et al, 2019 [47])</p> <p>Having to self-fund their course(Jhonston et al, 2001 [57])</p> <p>Self-expense for organizing locum in their absenteeism from work(Jhonston et al, 2001 [57])</p> <p>Temporary job or temporary time/shift patterns at work gives less opportunity to learning on job or reflective learning (O'Connor et al, 2006 [39]) (Taubert et al, 2011 [45])</p>
	Disempowerment of General practitioners	<p>Referral to specialists or experienced GPs(Selman et al, 2017 [24]) and when specialists take over the care (Rhee et al, 2008 [46]) (Pype et al, 2014 (a)[25]) leads to loss of control (O'Connor et al, 2006 [39])</p> <p>Lack of trust in GPs by specialists(Selman et al, 2017 [24])</p> <p>Do not consider GPs as doing a worthwhile job in EOLC(Selman et al, 2017 [24])</p> <p>GPs do not feel recognized for their job(Hermann et al, 2019 [38]) (Meijler et al, 2005 [48]) or appreciated for their work(Hermann et al, 2019 [38])</p> <p>Patients lack trust in general practitioner's ability to care(Hermann et al, 2019 [38])</p> <p>Inability to address patient's needs instilled a fear of strain in doctor-patient relationship(Meijler et al, 2005 [48])</p>
	Conflict in care provision	<p>Lack of clarity in roles and responsibilities (Pype et al, 2014 (a)[25]) (O'Connor et al, 2014 [40]) (Shipman et al, 2002[54])</p> <p>Fear of confronting specialists in a conflict in treatment(Shipman et al, 2002 [54])</p> <p>Fear of being reprimanded/accused by specialists(Shipman et al, 2002 [54])</p> <p>Delay in response from specialists (Shipman et al, 2002 [54])</p> <p>Past bitter experience with specialists can inhibit future interaction with specialists(Shipman et al, 2002 [54])</p>
Academic barrier	Training not aligned with clinical practice	<p>Most trainings being oncology focused gives them less opportunity to learn non malignant palliative care which comprises major part of their practice(Shipman et al, 2001 [53])</p> <p>Lack of locally based training resources(Jhonston et al, 2001 [57]) (Hermann et al, 2019 [38]) or counseling support(O'Connor et al, 2014 [40])</p> <p>Lack of consistency in training due to poor communication and documentation by specialists(O'Connor et al, 2014 [40])</p> <p>Most trainings are in-hour to which GPs have less exposure (Taubert et al, 2011 [45])</p> <p>Lack of same structure and resources in the community as in the hospital leads to inability to replicate the training acquired in the hospital back in the community (Pype et al, 2014 (a) [25])</p> <p>Lack of accreditation of palliative care(Hermann et al, 2019 [38])</p> <p>Lack of exposure to community during training period(Selman et al, 2017 [24])</p> <p>Training also depends on trainer's inclination to palliative care(Selman et al, 2017 [24])</p>