

## Supplementary Files

### Supplementary file 1

Supplementary Table 1: Activity Theory Concepts and Definitions

Supplementary Figure 1: Applied representation for this study

### Supplementary file 2

Data extraction form

### Supplementary file 3

Scoping review search strategy in Medline Ovid

### Supplementary file 4

Interview guide

## Supplementary file 1

Supplementary Table 1: Activity Theory Concepts and Definitions

Key concept	Definition	Application in prescribing and medication use	Explanatory notes
Activity	The work and effort undertaken by people to achieve an object (see below). Always collective, activities include ambiguity, surprise and sensemaking, all of which are considered to generate the potential for change, i.e. expansion of the object, and/or new ways of achieving it.	Processes, work, and efforts undertaken by patients, informal carers and healthcare professionals in prescribing and medication use for symptom control.	<p>At its very simplest the task of getting the right medication to the right patient at the right time requires six broad steps:</p> <ol style="list-style-type: none"> <li>1. Recognition of need, clinical assessment and decision-making</li> <li>2. Agreeing a prescription (choice of medication, formulation, route of administration) and ensuring this is completed by an appropriately qualified and competent professional</li> <li>3. Transfer of the prescription to a pharmacy for dispensing of medication</li> <li>4. Delivery of the medication back to the patient</li> <li>5. Administration either by the patient or by an appropriate person according to prescribing instructions</li> <li>6. Monitoring for clinical effects and side-effects as well as levels of supply and repeat requests and the disposal of medications no longer required</li> </ol> <p>A commonly overlooked additional step when patients die at home is the management of medications during the post-death bereavement period. These steps demonstrate that to view prescribing and medication use as the activity of an individual is a flawed approach<sup>1</sup> and greater understanding is needed of how each is achieved, by whom if we are to understand the sources of frustration in prescribing and medication use for patients, carers and professionals then identify potential improvement targets that are meaningful to them.</p>
Activity System	Historically evolving systems within organisations/contexts where activities take place.	For this study we have centred our focus on the patient. Therefore, our unit of analysis is patients' activity system incorporating the whole multi-step task of getting the right medication at the right time, and we will consider how their activity system has interacted with each context in their narratives of experiences at home, in hospice and in hospital and when moving between these.	<p>Increasingly in healthcare the boundaries between activity systems are blurred. With respect to prescribing and medication use, each context of home, hospice and hospital might each be considered as a separate activity system. However, the object of prescribing and medication use within each activity system can also be conceptualised as shared activities, within any setting in a local health economy where people with palliative care needs might be found.</p> <p>This is because the whole multi-step task of prescribing and medication use encompasses everything from identifying a palliative care need that requires medication to deciding what to prescribe, prescribing, dispensing and delivering supply to patients and administration in the context of providing holistic symptom control for people according to need, and regardless of diagnosis or location.</p>

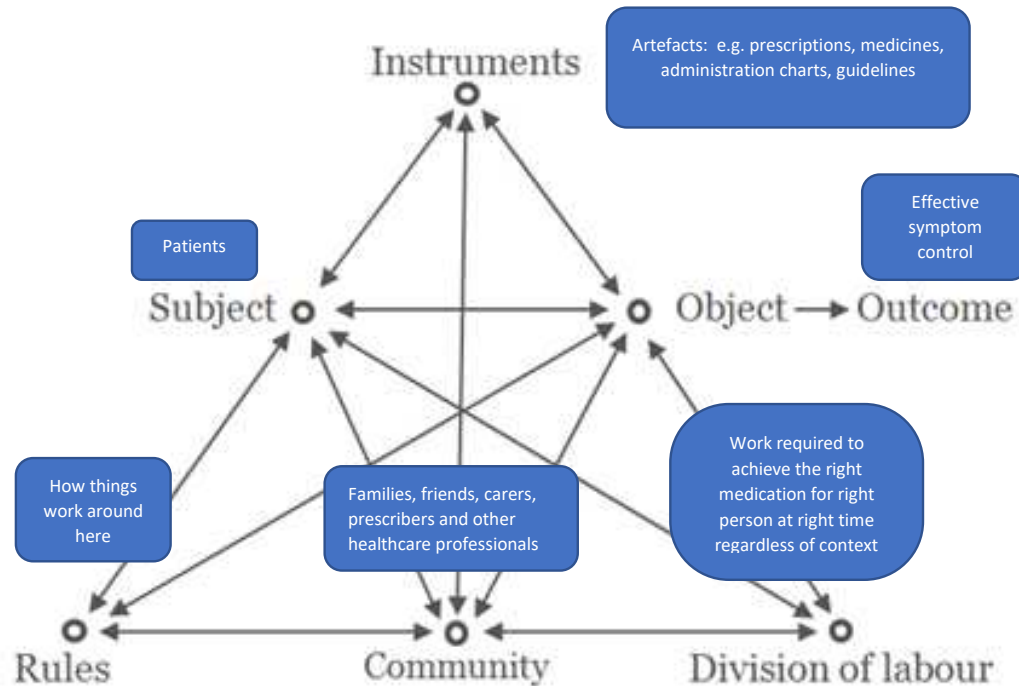
Community	People around the subject who are engaged in activities to achieve the object.	Achieving the object requires collective action of a large community of professionals together with patients and their informal network of carers (such as family and friends).	Multiple relations should be analysed while seeking to also analyse the systemic whole. Further complexities arise from societal myths and misconceptions about the purpose of palliative care and intended outcomes of using medications. The emotionally charged nature of interactions within palliative care may place particular demands on patients, those significant to them and professionals, with implications for their wellbeing.
Contradictions	<p>Contradictions occur within and between activity systems on several levels:</p> <p>Primary contradictions occur when there are internal contradictions within the elements of the activity system, e.g. use value vs. exchange value in the object.</p> <p>Secondary contradictions occur between different elements of the system e.g. subject vs rules.</p> <p>Tertiary contradictions occur when there is difference between the object of the prevailing activity and a new activity through resistance to change.</p> <p>Quaternary contradictions arise in parallel with the generalization of the new activity between the new activity and its neighboring activities (conflicts with others).</p>	<p>We will explore contradictions as a cause of disturbances in the study.</p> <p>Contradictions and disturbances in activity processes do create problems – such as the daily hassles of prescribing and medication use reported by patients, carers and healthcare staff alike – but also offer targets for new collectively generated solutions:</p> <p><i>“The distance between the present everyday actions of the individuals and the historically new form of the societal activity that can be collectively generated as a solution to the double bind potentially embedded in everyday actions”<sup>2</sup></i></p>	<p>Examples of each type will be sought. These might include things such as who should be prescribing and following up medication use, how different contexts permit different levels of patient choice in medication use or when an expert may choose to deviate from usual practice for specific reasons but this is not clearly communicated to others.</p> <p>Equally from a patient perspective, contradictions may arise between different priorities e.g. achieving good pain control versus beliefs about the use of strong analgesia such as opioids.</p> <p>Contradictions may also arise in different perceptions and assumptions about whose role or responsibility it is to contribute what activity within and when a patient moves between settings.</p> <p>Rather than viewing contradictions negatively within activity theory these will be viewed as sources of disturbance that hold the key to change and potential for improvement and learning.</p>
Disturbances/ Deviations (used interchangeably in Activity Theory literature)	These are: <i>“deviations from the normal scripted course of events in the work process, normal being defined by plans, explicit rules and instructions, or tacitly assumed traditions. A disturbance may occur between</i>	The concept of disturbance will be used to explore prescribing and medication use processes, presented as chronological patient experiences and in our study, are treated as important tools for rethinking and developing healthcare processes.	Activity systems (of patients, carers and professionals within and during transitions between home, hospital and hospice) are interdependent and at the same time potentially tension-laden relationships with each other, generating disturbances. Disturbances in care processes and may hinder holistic management of patient care. However, instead of being viewed as error-causing phenomena, we view disturbances as an inherent feature of work processes and as drivers for change and development. <sup>4,5,6,7</sup> Deviations may occur because of competing pressures or priorities. For example, while effective symptom control may be the intended

	<i>people and their instruments, or between two or more people. Disturbances appear in the form of an obstacle, difficulty, failure, disagreement, or conflict</i> <sup>3</sup>		object of activity competing objects such as the desire to please or avoid confrontation may cause disturbances in the process as may system failures or guidelines/protocols that are not practical to apply.
Divisions of labour	The divisions of labour describe how different individuals / roles act on the object of the activity.	Who is responsible to enact and ensure safety in each step of the process describes the division of labour. In reality this may not be clear or straightforward in all situations.	Divisions of labour tend to occur through use of implicit as well as explicitly developed norms (i.e. how we do things around here as well as officially promoted ways of how things should be done). Power is an important consideration in divisions of labour as inequalities in power will alter how divisions occur and are understood. Divisions may also evolve over time but will be influenced by what has historically been in place.
Expansive learning	In activity theory positive evolution and development of practice is framed as 'expansive learning' – that is learning which occurs through people interacting each other and co-producing new ways of working that better suit the goal to which they are working.	In order to understand how this can be achieved and where system breakdowns, barriers and facilitators or problems lie study of the existing practice and workplace context in which a particular goal, such as prescribing safety and effectively, is needed. In doing so it is important to pay attention to anything that creates a disturbance from ideal/intended/what happens on paper practice.	This type of learning can often start as in-situ 'work-arounds' that people develop informally. Research attempts to capture this so that it can be utilised further, bringing frontline innovations and initiatives into improvement strategies.
Mediating artefacts	The use of artefacts (tools and instruments) ideally driven by collective object-related motives to mediate actions between subjects and objects in the context of work.	Examples include: Using pathway protocols to standardize care procedures Medication administration / Drug charts Prescriptions (known as FP10s) Equipment for medication use	People both use inanimate mediating artefacts in their interactions with each other and assign these artefacts a place in the system. Understanding when an artefact has 'taken on a life of its own' i.e. is being used beyond its original intent or in novel ways to achieve / disrupt achievement of an object is important in understanding the dynamics of the community.
Object (goal)	Essentially what the subject needs and what the system and community should be trying to achieve. The object includes a collective motive (goal/outcome) and	The object of prescribing and medication use in palliative and end-of-life care is to achieve the best possible symptom control by delivering the right medication to the right person in a timely manner.	The sense and meaning of actions are attached to the object of an activity. Best possible symptom control is a collective object which enables a wider understanding of patient care and 'patient centredness' than the various specific potentially competing objects held by the many people involved in the process (i.e. professionals and carers as well as patients may also have other objects they pursue simultaneously, for example seeking to contain risks from potential side effects, or seeking to either share in or opt-out of prescribing decisions)

	connects actions of individuals to larger systems.		The concept of <b>object</b> can potentially widen our understanding of why disturbances take place. The existence of the multiple, specific and sometimes competing objects typically causes disturbances in care processes. The flexible aligning of the different and competing objects calls for the collective reflection, negotiation and reconceptualization of the object to enhance collaboration in the provision of patient care. <sup>8</sup>
Rules	The parameters within which activities take place.	These can be implicit (how things work around here) or explicit (e.g. legal regulations).	Due to the medications used there are complex and variable systems for prescribing, dispensing and administering in different settings and perspectives on division of labour to achieve this vary. The rules by which different people in the system are guided and constrained also vary and members of the community of professionals may or may not be party to understanding the context and capabilities of others.
Subject	The person who the object should serve.	In this case the patient.	
While we note that objects, rules, community and division of labour can be unclear, implicit and/or fluctuating this table provides an overview of these and other key concepts in Activity Theory. Understanding different perspectives on the specifics of the listed concepts is an essential part of using Activity Theory as a guiding framework for research. We have given a brief definition for each, followed by its potential application in our study of prescribing and medication use, and provided further explanatory notes to help those unfamiliar with this sociocultural theoretical approach. These have been modified from previous work studying antibiotic prescribing by members of the research team. <sup>9</sup>			

**Supplementary Figure 1: Applied representation for this study<sup>10</sup>**

Activity Theory is our methodological framework for understanding the processes and practices occurring from point of clinical decision that medication is needed to patient administration.



Using this framework we can place the patient and prescriber as subjects within a wider community of families, friends, carers and healthcare professionals between whom interactions will occur and the work of achieving the goal of symptom control through provision of the right medication at the right time regardless of setting requires a functional division of labour that meets everyone's understanding of the rules of 'how things work around here'.

The upper part of the diagram represents individual and group actions embedded in a collective system. The subject is whoever the activity (work, effort) is designed to benefit, for example patients. The instruments (tools, signs, artefacts) are the things used to achieve the benefit (for example a written prescription). The object is the goal of the activity (for example, medication for pain control) and the outcome is both the impact of the activity (does the patient get the medication when they need it and does it relieve them of pain) and the sense or meaning created by the patient and others about the activity.

The bottom part of the diagram provides a collective focus on the patient's environment, relationships and context. The community represents others around them (for example informal carers, healthcare professionals). The rules describe how formal systems and informal practices shape the activity – these may be written in policies (for example prescribing guidelines) or unwritten accepted norms (for example local preferences for one sort of medication over another for pain). The division of labour represents the differing roles and responsibilities of everyone involved in the activity. Divisions of labour are commonly characterised by ambiguity, interpretation and potential for change in complex systems involving many different people.

**Supplementary file 2****Data extraction form**

Reference: Authors and year of publication	Country of origin	Main study aim	Study design	Perspectives represented (e.g. doctor, nurse, pharmacist, patient, carer)	Context: home, hospital, hospice or transitions between these	Steps in processes included in study	Problems and challenges reported	Potential solutions or workarounds reported or suggested	Other key findings that relate to the scoping review question/s	Strength score

## Supplementary file 3

## Scoping review search strategy

Medline (Ovid)

Search conducted 14 July 2021

Search	Query	Records retrieved
S1	exp Patients/ OR exp Caregivers/ OR exp Spouses/ OR exp Family/ OR exp Friends/ OR Partner*.mp. OR carer*.mp. OR care giv*.mp. OR caregiv*.mp.	660,455
S2	Nurs*.mp. OR pharmacist*.mp. OR clinician*.mp. OR doctor*.mp.	1,142,041
S3	S1 OR S2	1,705,544
S4	exp medication therapy management/ OR prescri*.mp. OR exp Pharmacy Service, Hospital/ OR medic* management.mp. OR medic* reconcil*.mp. OR medic* safety.mp. OR medic* treatment.mp. OR exp Medication Errors/ OR medic* error.mp. OR exp Inappropriate Prescribing/ OR Inappropriate prescrib*.mp. OR suboptimal prescribe*.mp. OR exp Patient Safety/ OR patient safety.mp. OR side effect.mp. OR drug related side effects.mp. OR adverse drug reaction.mp. OR exp "Drug-Related Side Effects and Adverse Reactions"/ OR prescrip* appropriate*.mp. OR drug prescriptions.mp. OR exp Drug Prescriptions/ OR prescription appropriateness.mp. OR medic* review.mp. OR drug related problems.mp. OR Drug Interactions/ OR (drug adj1 safety).mp. OR patient harm.mp. OR Patient Harm/ OR exp Medication Systems/ OR exp Drug Utilization/ OR drug utilisation review.mp. OR exp "Drug Utilization Review"/ OR (utiliz* OR utilis* OR dispens*).mp. OR exp Patient-Centered Care/ OR patient centred care.mp. OR exp Pharmaceutical Preparations/ OR exp Drug Dosage Calculations/ OR exp Drug Prescriptions/ OR exp Polypharmacy/ OR self administration.mp. OR exp Self Administration/ OR exp Prescription Drugs/ OR exp "Off-Label Use"/ OR exp Infusion Pumps/ OR exp Infusions, Subcutaneous/ OR exp Injections, Subcutaneous/ OR medication*.mp. OR medicine*.mp.	3,299,100
S5	exp after-hours care/ OR exp "delivery of health care, integrated"/ OR exp practice patterns, pharmacists'/ OR exp practice patterns, nurses'/ OR exp practice patterns, physicians'/ OR exp professional practice gaps/ OR exp patient care team/ OR exp nursing, team/	149,956
S6	S4 OR S5	3,396,358
S7	exp Terminally Ill/ OR exp Terminal Care/ OR exp Palliative Care/ OR (Hospice and palliative care nursing).mp. OR exp Hospice Care/ OR exp Palliative Medicine/ OR palliat*.mp. OR CSCI.mp. OR Continuous subcutaneous infusion.mp. OR Just in case medic*.mp. OR symptom control.mp. OR syringe pump.mp. OR syringe driver.mp. OR McKinley.mp.	150,547
S8	S6 AND S7	29,153
S9	S3 AND S8	9,537



**Supplementary file 4****Interview guide**

*Interviews will be conducted using a semi-structured approach with:*

- *Patients and informal carers (if carer interviewed separately tailor questions to ask about their perspective on the person they care for)*
  - *Professionals*
- 1. Experiences of medications for symptom control in palliative care**
    - a. Ask participant to describe their experiences as a patient/carer/professional
    - b. Prompt for specific examples and explanations
      - i. What was happening?
      - ii. Who was involved?
      - iii. What needed to be done before/during/after each event or activity?
      - iv. What was good / worked well?
      - v. What wasn't good / didn't work?
      - vi. What could have made a difference?
    - c. Probe for detail on each step of the process (i.e each unit of analysis in the process) and the links/breakdowns between steps
      - i. Decision-making/Starting a medication
      - ii. Discussion of risks and benefits
      - iii. Prescribing /Taking/Adding a medication
      - iv. Monitoring and supply / Reviewing a medication
      - v. Administration
      - vi. Repurposing medications
      - vii. Addressing new concerns
      - viii. Stopping medications
      - ix. Moving across healthcare contexts
    - d. Ask about objects/tools mentioned and how these are used e.g. lists, prescriptions, medication boxes, reminders etc.
    - e. Ask who is responsible for what in each part of the process?
    - f. Ask how decisions are made?
    - g. Ask about 'how things work around here?' – what are the informal ways of working / getting things done? Are there 'rules' or understandings of things that 'are just how it is done'?
  - 2. Differences between settings**
    - a. How do things work at home v hospice v hospital (as applicable to each participants experience)?
    - b. What happens when people move between settings
      - i. Admissions and discharges
  - 3. Discussion of AT framework:**
    - a. Explain framework (as shown in figure 1) to participant and seek their feedback on how use of medication for symptom control in palliative care plays out within the system
      - i. Thinking about the system from different perspectives – ask participants how they think others see the system: patients/carers/professionals and how the system is viewed from hospice/hospital to home and vice versa?
      - ii. Where are there contradictions or breakdowns in the system?
  - 4. Anything else the participant would like to add?**

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