

## The effectiveness of primary care streaming in emergency departments on decision-making and patient flow and safety – A realist evaluation

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### A B S T R A C T

Primary care streaming was implemented in UK Emergency Departments (EDs) to manage an increasing demand for urgent care. We aimed to explore its effectiveness in EDs with different primary care models and identify contexts and mechanisms that influenced outcomes: streaming patients to the most appropriate clinician or service, ED flow and patient safety.

**Method:** We observed streaming and interviewed ED and primary care staff during case study visits to 10 EDs in England. We used realist methodology, synthesising a middle-range theory with our qualitative data to refine and create a set of theories that explain relationships between contexts, mechanisms and outcomes.

**Results:** Mechanisms contributing to the effectiveness of primary care streaming were: quality of decision-making, patient flow, redeploying staff, managing patients across streams, the implementation of governance protocols, guidance, training, service evaluation and quality improvement efforts. Experienced nurses and good teamworking and strategic and operational management were key contextual factors.

**Conclusion:** We recommend service improvement strategies, operational management, monitoring, evaluation and training to ensure that ED nurses stream patients presenting at an ED seeking urgent care to the most appropriate clinicians for their needs in a safe and efficient manner.

### 1. Background

Primary care streaming was promoted by the NHS in England in 2017 to help manage increasing demand on emergency departments (EDs) [1–3]. During a streaming assessment, an ED nurse assesses and directs patients, depending on their acuity, to an appropriate clinician (an ED or a primary care clinician) based on clinical availability and suitability [4]. We have previously described three different models of care where ED nurses stream patients to ED clinicians or clinicians: 1) working in a primary care service within or alongside an ED from the front door; 2) from inside the ED during a more complex assessment (including triage and streaming); or, 3) where primary care clinicians select their own patients from those waiting [4–6].

The role of nurses working in ED *triage* has been described as a

process where they carry out rapid focussed assessments to sort patients by acuity so that those with the greater need are seen first (within a patient stream). The nature of the work involves making decisions in an environment of uncertainty, under time pressure, and often with limited information available [7,8]. More experienced nurses working in a triage role have been suggested to use probability judgements (heuristics) based on prior clinical experiences [7], and use decision tools less than less experienced nurses, relying more on their intuitive knowledge [9]. However, the role of a *streaming* nurse is less well described (see Table 1 for definitions).

The aim of this paper is to gain an understanding of the different contexts in which primary care streaming occurs and the mechanisms which lead to perceived effectiveness in these different contexts [11]. We recognise that in some services that nurses and other ED staff can be

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**Table 1**  
Definitions of triage and streaming.

<b>Triage(4)</b>	A <b>clinical</b> activity to <b>sort</b> patients by acuity so that those with the greater need are seen first.
<b>Streaming (4)</b>	An <b>operational</b> activity to assess whether <b>low acuity</b> patients are suitable to be seen by an appropriate non-ED clinician.

involved in streaming patients such as paramedics and even general practitioners (GPs). We explore whether GPs do stream from the front door but the main focus is on nurses in a streaming role. Our outcomes of interest are streaming to the most appropriate clinician or service, ED flow and patient safety.

**2. Methods**

Realist methodology is a theory-driven approach to evaluation which is used to identify mechanisms (M) to explain how or why contexts (C) relate to outcomes (O) to generate theories described as context-mechanism-outcome (CMO) configurations [11]. We followed RAM-ESSES reporting and publication standards (see Appendix 1) [12].

We sought evidence to support, refute and refine four *initial theories* [see below] that we developed from a rapid realist review of the impact of general practitioners working in or alongside EDs [10] and to identify new theories.

**2.1. Initial theories**

1. Primary care clinicians and ED clinicians use their own personal experience and expectation (C) when interpreting streaming guidance (M) to influence which patients are streamed to general practitioners (O).
2. If streaming is performed by an experienced ED nurse (C) this may allow the primary care clinicians to treat patients with primary care type problems (M) which would improve flow in the ED (O).
3. GPs at the ED front door (C) can act as clinical decision-makers (M), improving patient flow by redirecting patients with primary care problems back out into the community or by admitting patients directly to the appropriate speciality (O).
4. Patients presenting to an ED with primary care problems (C) may take time to be redirected to the primary care stream (M) which can lead to duplicate assessments and delayed treatment (O).

**2.2. Sample**

We purposively selected and invited 13 EDs in England and Wales to participate using selection criteria (Box 1) and data from a survey sent to clinical directors of all type 1 EDs (a consultant led 24 h service with full resuscitation services) in England and Wales and based on a taxonomy of primary care services in EDs [4]. The survey asked about how the primary care service operated in the ED, who carried out streaming, which patients were streamed etc. From the survey we interviewed clinical directors of 21 EDs and purposively selected 13 EDs for in-depth case study. Here we report data from 10 sites, comprising three different

**Table 2**  
Primary care service models.

Primary care service model	Description
Inside: integrated	A primary care service fully integrated with the emergency medicine service, where staff see both primary and emergency care patients (n = 3; hospitals, 3, 8 and 14).
Inside: parallel	A separate primary care service within the ED, for patients with primary care type problems (n = 4; hospitals 4, 6, 7, 9).
Outside: onsite	Primary care service is elsewhere on the hospital site (n = 3; hospitals 10, 11,13).

models of ED primary care service (see Table 2; 3 control sites excluded).

**2.3. Data collection**

**2.3.1. Pre-visit interviews**

Interviews with clinical directors of the selected study sites (n = 13) explored how each service operated and their successes and challenges [5]. Questions about streaming focussed on which members of staff carried out streaming, how they made streaming decisions, the types of services to which they streamed patients, and how effective streaming was perceived to be [see Appendix 2]. Interviews were conducted by telephone or in-person by ME between February 2018 and March 2019 (average length 60 min). All interviews were audio-recorded and transcribed verbatim. Ethical approval for the survey and follow-up interviews with clinical directors was given by (anonymised) Ethics Committee (ref: 17/45).

**2.3.2. Observations and interviews at case study sites**

We (ME, a medical sociologist and AC, a clinical research fellow and GP) undertook two- to three-day visits to each case study site between February 2018 and April 2019. We observed the ED care pathway from patients arriving at the reception desk to triage and streaming assessments. We conducted formal interviews (with nurses who had time to take part in an audio-recorded interview) and short informal interviews (notes taken by a researcher during observations and at opportunistic times where nurses had a few minutes to spare) with nurses with responsibility for carrying out streaming and triage assessments and other clinicians (ED doctors and primary care clinicians). We used the realist teacher-learner interview technique to present initial theories and explore how mechanisms in different contexts may result in intended and unintended outcomes [see appendix 3 – example of interview guide] [20]. These realist interviews were audio-recorded (and transcribed verbatim) and we noted observations and informal interviews in field notes. Ethical approval for case study visits was given by South Wales Research Ethics Committee 1 (ref: 17/WA/0328).

**2.3.3. Analysis**

We analysed data from telephone interviews with clinical directors and case study visits (observations and interviews with ED nurses, ED clinicians and GPs). Our coding framework (created in NVivo 11, QSR International) included the four initial theories and our outcomes of interest: streaming to the most appropriate service, ED flow and patient safety [10]. We coded data using explanatory ‘if, then, because statements’ to capture the nuance of different contexts [13]. We synthesised these statements into higher level Context-Mechanism-Outcome configurations [11]. We then mapped these against the different primary care service models (inside-integrated, inside-parallel, outside-onsite) [4] and factors influencing our outcomes of interest. We based our synthesis on Pawson’s theory-building processes (juxtaposition, reconciliation, adjudication and consolidation) [11]. We incorporated the expert knowledge of primary and emergency care academics and patients in our theory refinement and development by discussing early findings with the wider study team and public contributors, clinicians and policy experts, and refined our analysis based on feedback.

**2.4. Incorporating middle-range theory**

We integrated a psychological theory, the *Revised Cognitive Continuum Theory (RCCT)* [14], with our findings to explain mechanisms related to the way nurses make decisions, which then may influence the effectiveness of primary care streaming. The RCCT has been used previously to understand triage decision-making in EDs [9,16,17] and to guide practice and training to develop nurses’ knowledge and skills in clinical judgement and decision-making [9,14].

The RCCT includes *nine modes of practice* that exist on a continuum where sources of knowledge range from tacit intuitive knowledge to

Box 1: Selection criteria for the purposive sample of emergency departments

- Variation in service model (see Table 1)
- Spread of geographical locations in England and Wales
- Variety of contexts - including hospitals in rural and urban locations, small and large hospitals, higher vs lower attendances
- Variation in streaming method – who streams, streaming criteria and guidance
- Variation in the physical layout of the department
- Variation in relationship with the GP out-of-hours services

analysis (explicit knowledge). These are: 1) intuitive judgement, 2) reflective judgement, 3) patient and peer-aided judgement, 4) system-aided judgement, 5) critical review of experimental and research evidence, 6) action research and clinical audit, 7) qualitative research, 8) survey research and 9) experimental research. The first four modes of practice have been related to triage decision-making [9,14] (see Table 3).

2.5. Developing a programme theory

We aimed to refine initial theories and identify new ones and organise our analysis to develop a programme theory to explain the relationships between the contexts and mechanisms that influenced effectiveness outcomes.

2.6. Patient and public involvement

Two patient and public members were involved in the study design and as co-applicants in the funded study [15]. They used their experience as NHS patients to contribute to the study design, including interview guides, and interpretation of findings and theory refinement. They were involved in discussing the draft theories in Management Group and Working Group meetings. They contributed to the drafting and revision process and reflected on terminology used [18]. They are also involved in all dissemination activities including co-authoring this paper.

3. Results

We include qualitative data from interviews ED staff (clinical directors, ED nurses, ED clinicians and GPs) during field work at 10 hospitals that had primary care services in or alongside EDs. Our results confirm, refute and refine theories that we took into our evaluation and identify new theories to produce a programme theory explaining the contexts (C), mechanisms (M) and outcomes (O) [11] relating to primary care streaming (see Table 4). We organise our findings based on our three outcomes of interest and then by context.

**Table 3**  
Cognitive modes of practice related to triage decision-making [12,18].

Cognitive mode	Behaviours
<b>Intuitive judgement</b>	- Coming to judgements without being aware of the process
<b>Reflective judgement</b>	- Reflecting on actions and past experience
<b>Patient and peer-aided judgement</b>	- Patients and peers contribute information and participate in decision-making
	- Discussing intervention options with colleagues
	- Seeking expert advice from colleagues of different disciplines and levels of expertise
<b>System-aided judgement</b>	- The use of policies and procedures, clinical guidelines, validated assessment tools, computerised decision analysis systems to guide clinical judgement and decision-making

3.1. Outcome 1: Streaming to the most appropriate clinician or service

3.1.1. Context: Nurse experience

More experienced ED nurses, emergency nurse practitioners (ENPs) and advanced nurse practitioners (ANPs) (C) either carried out a rapid streaming assessment at the front door or a complex triage assessment inside the ED, depending on the model of service [6]. They reported that they reflected more on their higher levels of experience and use their *intuitive* knowledge to make streaming decisions. Thus, they incorporated both *intuitive* and *reflective judgement* in their decision-making (M). In interviews they reported that they were more confident in their decision-making (C) leading to better streaming decisions (M), and were more effective in streaming patients to the service/clinician most appropriate to meet the patient’s needs (O).

*“We have to have experience up front because it’s an extremely important job getting them in the right place”.* (Senior nurse at hospital 10, streaming at the front door, outside-on-site model)

Less experienced nurses (C) were perceived to have ‘less intuitive knowledge’ (hospital 3), lacked skills in making triage assessments and in assessments in relation to primary care, and to make poorer streaming decisions (O). They used *intuitive* and *reflective judgement* less and relied more on *system-aided judgement* to inform their decisions (M). Where streaming guidance was not well developed, less experienced nurses were thought to be more at risk of making errors in their streaming decisions (M). Some GPs reported that less experienced nurses lacked knowledge of the types of patients that GPs manage and their scope of practice in terms of access to investigations and making referrals (C). They were also perceived to have less confidence in their decision-making and communicating decisions to patients (C).

*Sometimes, the right decisions aren’t necessarily being made……. there just isn’t that experience and that intuitive knowledge …”.* (ENP at hospital 3, inside-integrated model)

At one ED there was a decline in higher band nursing staff retention due to competing job opportunities in other areas of nursing (C). This meant that the skill-mix of the nursing team comprised more lower band (less experienced) nurses (C), and was felt to have a negative impact on the effectiveness of streaming (O).

3.1.2. Context: Streaming guidance and training

Locally adapted guidance, protocols and training (C) supported nurses making streaming decisions (promoting *system-aided judgement*) (M), aiming to ensure patients were streamed to the most appropriate clinician or service (O). However, relying too much on guidance could be problematic: junior nurses (C) were reported by senior nurses to rely too much on streaming criteria because they did not consider the type of intuitive questions that more experienced nurses might ask (M), and this might lead to patients being inappropriately streamed to primary care clinicians (O). One ENP emphasised the importance of experience and confidence to override guidance, based on intuition.

*“We have the flow charts…….but I think there’s also a place for experience and clinical judgement, and knowing where to override the*

**Table 4**  
Initial theories, refined theories and new theories.

Patients streamed to the most appropriate clinician or service	
Initial theory 1	GPs and ED staff use their own personal experience and expectation (C) when interpreting streaming guidance (M) to influence which patients are streamed to general practitioners (O)
Initial theory 2	GPs in ED at the front door (C) can act as a senior decision-makers (M) improving patient flow by redirecting patients with primary care problems back out into the community or by admitting patients directly to the appropriate speciality (O).
Not confirmed	There was insufficient evidence of GPs streaming to support these theories. Only one GP saw patients in triage using a see and treat method.
Refined theory	More senior and experienced ED nurses and nurse practitioners are more knowledgeable and skilled in their role and have more confidence in their clinical judgement (C), they integrate their experience and intuitive knowledge with local guidance when assessing patients, and make better decisions about which streaming pathway patients are allocated to (M) and are more effective in streaming patients to the most appropriate service (O).
New theory	If locally adapted guidance and training is in place to support nurses making streaming decisions (C), they will be clear and make better decisions about which streaming pathways are available and appropriate (M), and they will stream patients to the most appropriate service (O).
New Theory	If there are good team-working relationships and communication between the ED team and the primary care team (C), the streaming nurses may have a better understanding of how primary care team members work and what kind of patients they see (C), and so will make better decisions about which service to stream patients to (M), and they will stream patients to the most appropriate service (O).
<b>Patient flow</b>	
Initial theory 3	GPs in ED at the front door may be over skilled for this role (M) which if alternatively performed by an experienced nurse (C) would allow the GPs to treat patients (M) which would improve flow in the ED (O)
Not confirmed	There was insufficient evidence of GPs streaming to support the above theory. Only one GP saw patients in triage using a see and treat method.
New Theory	Less experienced nurses are less knowledgeable, skilled in assessing patients and experienced in making streaming decisions (C) and can be less confident in communicating with ED staff about patients (C), therefore they take more time carrying out assessments and making decisions about where to stream patients (M) and streaming may be less effective in reducing waiting times and improving patient flow in the ED (O). More experienced nurses and nurse practitioners (C) use their knowledge and clinical skills to perform extra activities during a complex assessment (e.g. order tests, redirect to community primary care or hospital services) (M) potentially contributing to reduced waiting times, length of stay and improved patient flow (O).
New Theory	If there is no clear guidance about which patients primary care staff see or the guidance is too strict (C), then primary care staff may not see all patients that could potentially be seen by a primary care clinician (M), and streaming may not be effective in improving waiting times and patient flow in the ED (O).
New Theory	In departments where managers are involved in evaluating streaming (C) and respond to identified problems with strategies such as protocols, guidance, training and quality improvement activities (M) these can contribute to improvements in waiting times and patient flow (O).
New theory	If there is a senior person managing the streaming process and monitoring flow in the department (C), they can make operational decisions to help move patients through the department or move staff around the department to manage demand (M), and can potentially contribute to reduced waiting times and improved patient flow (O).
<b>Patient safety</b>	
Initial theory 4	Patients presenting to an ED with primary care problems (C) may take time to be redirected to the primary care stream (M), which can lead to duplicate assessments and delayed treatment (O).
Refined theory	If patients are inappropriately assessed and streamed to one service and then need to be (re-) streamed back to another service (C), they spend more time waiting to be seen (M) and may experience delays

**Table 4 (continued)**

Patients streamed to the most appropriate clinician or service	
	in receiving appropriate care and treatment and so may be exposed to safety risks (O).
Refined theory	If there are no established protocols, guidance and training for streaming (C) or the streaming nurses are less experienced (C), patients may not be adequately assessed (M) and nurses may stream higher risk patients to a primary care clinician (M), and so primary care clinicians will see patients for whom they do not have appropriate skills and experience, increasing the risk of a patient safety incident (O).
New Theory	When senior nurses stream at the front door (C), they can identify the sickest patients early and hand them over to the most appropriate clinician in a timely manner (M), reducing their risk of deterioration whilst waiting to be seen (M) and potentially contribute to safer care for patients in the ED (O).

*guidance, and that comes with confidence and experience.*” (ENP, hospital 3, inside-integrated model)

**3.1.3. Context: Team-working and communication**

When the ED and primary care staff had positive team-working relationships (C) there was good communication between the ED and primary care team. This enabled ED nurses to also develop better knowledge of the skill-set in the primary care team and which patients they could stream to them (M), so patients were more appropriately streamed (O).

“it’s developing an understanding between ourselves and the urgent care team about what can and can’t be seen” (Nurse, at hospital 6, inside-parallel model)

Having GPs working in the ED who also worked in the local community (C) meant that the ED nurses in streaming and triage roles already had experience of speaking with them about patients needing primary care (M), and this facilitated positive teamworking and communication within the ED (O).

*“we’re just able to work with them so much more closely, because they’re based in the local community, they’re the GPs we talk to on the phone”* (Clinical director at hospital 7, inside parallel model)

**3.2. Outcome 2: Waiting times and patient flow**

**3.2.1. Context: GPs working in a streaming role**

There was no evidence of GPs routinely acting in a streaming role. However, at hospital 14 the lead GP sometimes saw patients during a triage assessment when the department was very busy (C). He reported that he was able to improve patient flow (O) by ‘seeing and treating’ patients during their initial assessment (M). However, it was not felt to be sustainable nor a desirable role for other staff due to the intensity of the decision-making (M) and a higher patient safety risk (O).

*“it really helps just clear the triage stream for a bit, but what we’ve found with that is it’s very labour intensive, it’s hard work, difficult...it is high pressure, it’s high turnover, and it’s quite high risk, because you are making very quick decisions and turning people around.* (GP at hospital 14, inside integrated model)

**3.2.2. Context: Nurse experience**

Highly experienced nurses (C) made quicker and better quality streaming decisions (M), allowing patients to move through the ED more quickly (O). They were perceived by clinical directors and other ED clinicians as making better decisions about discharging and redirecting patients with non-urgent problems to community primary care services (M), and to be more confident communicating their decisions to patients (M), helping to improve patient flow (O)

“Some of the more experienced triage nurses, particularly ones who are also ENPs, they’ll be used to making those decisions about discharging patients, so they’ll often feel comfortable to say, “that’s such a minor injury, you don’t need to wait and be seen”, or “that’s very much (a community) primary care condition, we’re not going to be able to help you with that...” (Clinical director at hospital 4, inside-parallel model)

Because junior nurses were less experienced in using their *intuitive and reflective judgements* (C), they took longer to carry out assessments and were more cautious in making streaming decisions (M). They were sometimes reported to order unnecessary investigations during a complex assessment (M), so some patients waited longer to be seen (O). They also experienced delays in obtaining support with their decisions because they were less experienced and confident in communicating with more senior ED staff and the primary care clinicians to influence their decisions about which patients might be appropriate for them to see. Thus, there were fewer opportunities for *peer-aided judgement* (M) leading to poorer patient flow (O).

“...they will go in too deep to why people have come, which then takes time...they have less influence ...some of them don’t know how to approach sort of people ... and talk to them in a medical way that speeds this transition along”. (ANP at hospital 13, outside onsite model)

### 3.2.3. Context: Guidance

Where there was no clear guidance established in relation to which patients GPs could see (C), some of the ED staff perceived GPs to be selective about which patients they saw (M) resulting in them seeing fewer patients than expected (O). Conversely, where guidance was too strict (C) and GPs did not have flexibility about which patients they could see (M), streaming was also perceived to be less effective on patient flow (O).

### 3.2.4. Context: Operational and strategic management of streaming

In EDs where streaming was inside the ED (C), a senior staff member (i.e., nurse in charge, ED consultant in charge or GP) screened the notes of patients already streamed to the ED to identify patients that could be changed to the primary care stream (M) to improve flow (O). At hospital 13, a (non-clinical) operational manager had responsibility for managing flow in the ED (C). He made decisions about suspending streaming to urgent care when the demand for primary care was high and the capacity in the urgent care service was limited (M). This was to prevent primary care patients from waiting for extended periods of time and to enhance overall flow (O).

“I’ll oversee exactly how many patients are in there, how many patients are going down there per hour and whether the GP is struggling or not”. (Operations manager, hospital 13, outside-onsite model)

Strategies such as training and mentoring for nurses, local level evaluation, developing local guidance and streaming pathways, and creating physical spaces from which nurses can stream and to which patients can be streamed (M) aimed to help improve flow (O).

“We run rapid improvement workshops..... we spot bits of the processing that aren’t right and think about how we could make it better...” (Medical director at hospital 6, inside-parallel model)

## 3.3. Outcome 3: Safe streaming decisions

### 3.3.1. Context: Nurse experience

With no clear guidance available to support their judgement and decision-making, less experienced nurses were reported by some clinical directors, GPs and more senior nurses to have sometimes missed ‘red flags’, and inappropriately streamed patients needing emergency care to a primary care service, causing risk of healthcare-associated harm. Thus,

when more junior nurses made streaming decisions based solely on their limited clinical experience (*intuitive and reflective judgements*) (C), there was considered more scope for error with potential for delays in assessment and appropriate treatment when patients needed to be re-directed back to the ED (M), and increased risk of experiencing a patient safety incident and related healthcare-associated harm (O).

*A patient presented at a triage assessment with a rash on his leg and was streamed to the out-of-hours GP. The GP sent him back to wait to be seen in the ED for further investigations with suspected deep vein thrombosis.* (Observation of triage at hospital 4, inside-parallel model)

Placing experienced streaming nurses (or ENPs/ANPs) at the front door of the ED (C) enabled them to attend quickly to very sick patients who needed to be handed over to ED staff for immediate care (M). They used their intuition (*intuitive judgement*), experience (*reflective judgement*) and locally developed streaming guidance and validated triage tools such as Manchester Triage (*system-aided judgement*) (C) to make decisions about where patients need to be streamed to (M). They further used their communication skills (*peer-aided judgement*) to participate in collaborative decisions with colleagues when handing over patients (M), to ensure patients are seen quickly by the appropriate team of clinicians (O). Below is a quote from an ANP describing how she ensures that patients who need to be seen quickly by an ED clinician are handed over safely and without delay.

“...you then have to leave the streaming box, or the streaming area, to go and speak to the people in A&E, um, to hand this patient over essentially.... you’ve identified this clinical need for this patient but what you don’t want is for their card to languish on the top of printer until the team leader sees it, picks it up, and then calls them through to a cubicle”. (ANP, hospital 13, outside-onsite model)

## 3.4. Relationships between contexts, mechanisms and outcomes for effectiveness

Figure 1 presents a programme theory portraying the mechanisms influencing streaming effectiveness. These are: quality of decision-making, efficiency in moving patients through the service, capacity to redeploy staff and transfer patients across streams to meet demand, and implementation of governance protocols, guidance, training, service evaluation and quality improvement efforts. Department level contexts influence these mechanisms through: the level of experience of the streaming nurse; the availability and quality of streaming guidance; teamwork and communication between teams; operational management of demand and capacity in the service; and strategic management (protocols, guidance, training, service evaluation, quality improvement efforts).

Certain outcomes (e.g., streaming to the most appropriate service and improvement in patient flow) also influence patient safety. Strategic and operational management also influenced other contextual factors such as the experiences of nurses, the implementation of guidance, teamwork and communication.

## 4. Discussion

### 4.1. Principal findings

We studied a diverse range of EDs to help refine our initial theories and develop further theories. We have produced a programme theory to explain the contexts in which primary care streaming occurs and describe the mechanisms which influence effectiveness outcomes: 1) whether patients are streamed to an appropriate service, 2) impact on the patient flow and waiting times in the ED and 3) patient safety.

The contextual factors we have described (in our programme theory) can be actively managed to try to improve the quality of streaming



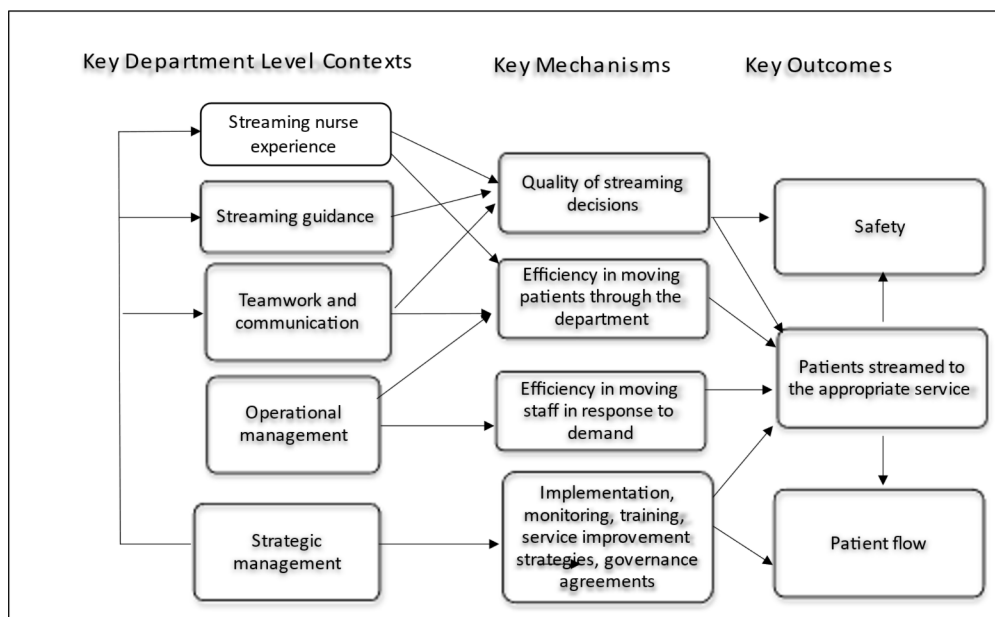


Fig. 1. Programme theory.

decisions, the efficiency of assessing and moving patients through the ED, the way staff are deployed in the department to meet the type and level of demand for urgent or emergency care, and the implementation of strategies to ensure staff in a streaming role are trained, streaming is monitored, evaluated and improved, and governance is agreed between service providers.

#### 4.2. Context of other literature

Our findings build on previous research where we described the range of initial assessments, and the ways patients are directed to emergency and primary care clinicians, in the ED or to other primary and secondary services, on and off hospital sites [6]. We have focussed here on perceived effectiveness outcomes in relation to primary care streaming, using qualitative data about what mechanisms clinicians working in an ED perceive to influence the outcomes.

Using a middle range theory (RCCT) [14] as a theoretical lens to help us examine our findings helped explain how experienced and senior nurses stream patients from the front door using their *intuitive and reflective judgement* to make quick decisions. However, in some EDs, nurses carry out a more complex assessment inside the ED and make use of decision tools and computerised triage systems using *system-aided judgement*, which requires less intuition and takes longer but is recommended for safer decisions. These findings are consistent with other literature describing nurses decision-making during triage assessments [7,9].

### 5. Implications for policy and practice

To guide our consideration of implications for policy and practice we draw upon recent policy, contexts mechanisms and outcomes referred to in our developed and refined theories (see Table 4) and middle-range theory (see Table 3).

Rather than taking a top-down and national-level approach to policy, we recommend services adopt a collaborative approach to implementing primary care streaming (including input from ED clinicians and primary care clinicians) that considers the local context, particularly the skill-sets of both the ED and primary care staff involved (see Table 4, re new theory relating to teamworking).

Smith (2013) suggests that in order to develop intuitive, reflective

and patient and peer-aided judgement (see Table 3), junior nurses should be rotated through various clinical settings to build their 'repertoire of experiences' that can be used in triage decision making [9]. We support this recommendation for nurses in a streaming role and recommend the following mechanisms to help ensure an outcome where patients are streamed to the most appropriate service:

- Training plans for nurses should include knowledge of primary care conditions, how the primary care staff in the department work (including their areas of special interest), what kind of patients they see and what kind of investigations they are expected to carry out.
- Training on sharing decisions [19] with patients about streaming and redirection.

To help the outcome of improve patient flow we suggest the following mechanisms:

- Senior/ more experienced nurses are best placed for streaming at the front door.
- Alternatively, where nurses stream from inside the ED, a nurse in charge may be able to (re-)review notes of patients waiting to identify whether patients could change stream from ED to primary care and potentially reduce the number of patients waiting for ED or primary care clinicians.
- Senior managers should monitor the capacity in both services and adjust streaming methods in response to variation in demand to help waiting times and flow.

To enhance the context of positive team-working we suggest the following mechanisms:

- Joint involvement of both Primary Care and ED teams in developing streaming guidance and training
- Providing opportunities for ED staff to get to know the individuals working in the primary care team and learn more about how they work

### 6. Future research

Further research could use retrospective analysis of adherence to

streaming guidance and criteria using case reports to understand the impact on outcomes and understanding variation in the effectiveness of the guidance. Evaluation of interventions designed to address our recommendations (above) will be helpful. Future research could also focus on trying to understand more about the development of streaming protocols and guidance, the extent to which streaming criteria match the needs of both the emergency care and primary care services, and the experience and skill-sets of ED nurses and the clinicians within the primary care team.

## 7. Strengths and limitations

We included a range of different primary service models in EDs of different size and serving rural and urban communities in our evaluation, and gathered rich qualitative data to explain the contexts and mechanisms relating to streaming effectiveness. This enabled us to explain perceptions of effectiveness e.g., patient flow and safety reported by clinicians and thus our findings are not based on actual measures of flow and safety. However, we recognise that our sample may not be representative of all type 1 EDs with primary care services in the UK and there may be other methods of streaming and mechanisms for streaming effectiveness [6].

## 8. Conclusion

We have described the contextual factors and mechanisms that are perceived to affect whether patients are efficiently and safely streamed to primary care or emergency care clinicians when attending an ED. We recommend implementing service improvement strategies, operational management, monitoring, evaluation and training to ensure that experienced ED nurses are deployed at the front door or inside the ED to assess and stream patients presenting at an ED seeking urgent care to the most appropriate clinicians for their needs in a safe and efficient manner. Further research is needed to evaluate streaming guidance and criteria in relation to how it meets the needs of EDs that include primary care services or have primary care clinicians working alongside ED clinicians.

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## CRedit authorship contribution statement

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**Stevens:** Conceptualization, Writing – review & editing. **Jeremy Dale:** Conceptualization, Writing – review & editing. **Peter Hibbert:** Conceptualization, Writing – review & editing. **Barbara Harrington:** Conceptualization, Writing – review & editing. **Julie Hepburn:** Conceptualization. **Aloysius Niroshan Siriwardena:** Conceptualization, Writing – review & editing. **Helen Snooks:** Conceptualization, Writing – review & editing. **Adrian Edwards:** Conceptualization, Methodology, Visualization, Project administration, Funding acquisition, Supervision, Writing – review & editing.

## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## References

- [1] The Government Response to the House of Commons Health Select Committee Report on Winter Pressure in Accident and Emergency Departments. London; 2017.
- [2] Lacobucci G. All A&Es must have GP led triage. *BMJ* 2017;356:j1270.
- [3] NHS Improvement. Seven day urgent care GP centre at Luton and Dunstable [Available from: [https://improvement.nhs.uk/documents/118/7\\_day\\_service\\_s\\_-\\_urgent\\_care\\_GP\\_centre.pdf](https://improvement.nhs.uk/documents/118/7_day_service_s_-_urgent_care_GP_centre.pdf)].
- [4] Cooper A, Edwards M, Brandling J, Carson-Stevens A, Cooke M, Davies F. Taxonomy of the form and function of primary care services in or alongside emergency departments: concepts paper. *Emergency Med J* 2019;36(10):625–30.
- [5] Edwards M, Cooper A, Davies F, Sherlock R, Carson-Stevens A, Price D, et al. Emergency department clinical leads' experiences of implementing primary care services where GPs work in or alongside emergency departments in the UK: a qualitative study. *BMC Emergency Med* 2020;20(1):62.
- [6] Edwards M, Cooper A, Hughes T, Davies F, Sherlock R, Anderson P, et al. A classification of primary care streaming pathways in UK emergency departments: Findings from a multi-methods study comprising cross-sectional survey; site visits with observations, semi-structured and informal interviews. *Int Emergency Nurs* 2021;56.
- [7] Cioffi J. Decision making by emergency nurses in triage assessments. *Accid Emerg Nurs* 1998;6(4):184–91.
- [8] Reay G, Rankin JA. The application of theory to triage decision-making. *Int Emerg Nurs*. 2013;21(2):97–102.
- [9] Smith A. Using a theory to understand triage decision making. *Int Emerg Nurs* 2013;21(2):113–7.
- [10] Cooper A, Davies F, Edwards M, Anderson P, Carson-Stevens A, Cooke M, et al. The impact of general practitioners working in or alongside emergency departments: a rapid realist review. *BMJ Open* 2019;9(4):e024501.
- [11] Pawson R, Tilley N. An introduction to scientific realist evaluation. *Evaluation for the 21st century: A handbook*. 1997:405–18.
- [12] Wong G, Westhorp G, Manzano A, Greenhalgh J, Jagosh J, Greenhalgh T. RAMESES II reporting standards for realist evaluations. *BMC Med* 2016;14(1):96.
- [13] Pearson M, Brand SL, Quinn C, Shaw J, Maguire M, Michie S, et al. Using realist review to inform intervention development: methodological illustration and conceptual platform for collaborative care in offender mental health. *Implement Sci* 2015;10(1). <https://doi.org/10.1186/s13012-015-0321-2>.
- [14] Standing M. Clinical judgement and decision-making in nursing—nine modes of practice in a revised cognitive continuum. *J Adv Nurs* 2008;62(1):124–34.
- [15] Edwards A. Evaluating effectiveness, safety, patient experience and system implications of different models of using GPs in or alongside Emergency Departments. NIHR Grant reference 15/145/04.
- [16] Cader R, Campbell S, Watson D. Cognitive continuum theory in nursing decision-making. *J Adv Nurs* 2005;49(4):397–405.
- [17] Moll HA. Challenges in the validation of triage systems at emergency departments. *J Clin Epidemiol* 2010;63(4):384–8.
- [18] Staniszewska S, Brett J, Simera I, Seers K, Mockford C, Goodlad S, et al. GRIPP2 reporting checklists: tools to improve reporting of patient and public involvement in research. *BMJ*. 2017;358:j3453.
- [19] Shared Decision Making. National Institute for Health and Care Excellence 2021.
- [20] Manzano A. The craft of interviewing in realist evaluation. *Evaluation* 2016;22(3):342–60.