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# The Impact of Prehospital Communication Quality on Emergency Department Preparedness and Patient Care Outcomes: A Systematic Review

أثر جودة التواصل قبل الوصول إلى المستشفى في جاهزية أقسام الطوارئ ونتائج الرعاية المقدمة للمرضى: مراجعة منهجية

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**Abstract:**

**Background:** Communication before ambulance arrival and during transfer of care is a potential determinant of emergency department (ED) preparedness, treatment timeliness, and patient safety. Variation in pre-alert thresholds, message content, transmission, and handover practices may undermine these benefits.
**Objective:** To synthesize research on how the quality of communication between prehospital clinicians and ED teams relates to operational preparedness, clinical process measures, and patient-oriented outcomes.
**Methods:** An evidence-grounded narrative synthesis was assembled from verifiable primary studies and relevant methodological literature dated 2020–2026. Studies addressed advance notification, structured verbal handover, communication processes, or team coordination at the EMS–ED interface. A reproducible search and prespecified appraisal framework are provided for formal systematic-review completion. Because an exhaustive database search and independent screening were not executed for this draft, no PRISMA selection totals or pooled effect estimates are reported.
**Results:** Evidence from stroke and ST-elevation myocardial infarction cohorts consistently associated prehospital notification or activation with faster in-hospital treatment. In a 2,498-patient STEMI cohort, median door-to-balloon time was 34 versus 86 minutes with versus without prehospital activation; adjusted associations with cardiovascular mortality were also reported. In stroke cohorts of 1,053 and 1,107 patients, notification was associated with shorter times to imaging and treatment. An Indian trauma study documented improvements in trauma-bay and team readiness after implementing a notification pathway. A 307-patient ED quality-improvement study associated synchronous team handover with more timely diagnostic tests and disposition. Qualitative, survey, simulation, and tool-validation studies highlighted variation in alert use, ambiguous responsibility, interruptions, information loss, and the value of structured handover.
**Conclusion:** Timely, accurate, and actionable EMS–ED communication appears to improve operational readiness and selected time-sensitive process outcomes. Evidence for an independent effect on mortality, long-term function, and preventable adverse events remains heterogeneous and largely observational. Standardized pre-alert criteria, minimum datasets, shared-team handover, and feedback systems warrant formal prospective evaluation.

**Keywords:** Emergency medical services; prehospital communication; ambulance pre-alert; emergency department preparedness; patient handover; patient safety; systematic review.

**الملخص**

الخلفية :يُعد التواصل الذي يتم قبل وصول سيارة الإسعاف، وأثناء تسليم مسؤولية رعاية المريض، أحد العوامل المحتملة المؤثرة في جاهزية أقسام الطوارئ، وسرعة تقديم العلاج، وسلامة المرضى. وقد يؤدي التباين في معايير إرسال التنبيهات المسبقة، ومحتوى الرسائل، وآليات نقل المعلومات، وممارسات تسليم المرضى إلى الحد من الفوائد المتوقعة لهذا التواصل.
الهدف :استعراض الدراسات البحثية المتعلقة بكيفية ارتباط جودة التواصل بين الممارسين الصحيين في مرحلة ما قبل الوصول إلى المستشفى وفرق أقسام الطوارئ بالجاهزية التشغيلية، ومؤشرات العمليات السريرية، والنتائج الصحية المتمحورة حول المريض.
المنهجية :أُعدّ تركيب سردي للأدلة يستند إلى دراسات أولية قابلة للتحقق وأدبيات منهجية ذات صلة منشورة خلال الفترة 2020–2026. وتناولت الدراسات الإخطار المسبق بوصول المرضى، وتسليم المعلومات الشفهي المنظم، وعمليات التواصل، أو تنسيق العمل بين الفرق عند نقطة الاتصال بين خدمات الطوارئ الطبية وأقسام الطوارئ. كما قُدّمت استراتيجية بحث قابلة لإعادة التطبيق وإطار تقييم محدد مسبقاً لاستكمال المراجعة المنهجية بصورة رسمية. ونظراً إلى عدم تنفيذ بحث شامل في قواعد البيانات، وعدم إجراء الفرز المستقل للدراسات في هذه المسودة، فلم تُعرض أعداد الدراسات وفق مخططPRISMA ، كما لم تُقدَّم تقديرات تجميعية لحجم التأثير.
النتائج :أظهرت الأدلة المستمدة من مجموعات مرضى السكتة الدماغية واحتشاء عضلة القلب المصحوب بارتفاع مقطع ST ارتباطاً متسقاً بين الإخطار المسبق قبل وصول سيارة الإسعاف أو تفعيل مسارات الاستجابة العلاجية وبين تقليل الوقت اللازم لتقديم العلاج داخل المستشفى. ففي مجموعة مرضى احتشاء عضلة القلب المصحوب بارتفاع مقطعST ، التي شملت 2,498 مريضاً، بلغ وسيط الزمن من وصول المريض إلى المستشفى حتى إجراء توسيع الشريان التاجي بالبالون 34 دقيقة لدى المرضى الذين

فُعّلت لهم الاستجابة مسبقاً، مقارنة بـ86 دقيقة لدى المرضى الذين لم يُفعّل لهم هذا الإجراء، كما أُبلغ عن وجود ارتباطات معدّلة بمعدل الوفيات القلبية الوعائية. وفي مجموعتين من مرضى السكتة الدماغية، شملتا 1,053 و1,107 مرضى، ارتبط الإخطار المسبق بتقليل الوقت اللازم لإجراء التصوير وتقديم العلاج. كما وثّقت دراسة هندية متعلقة بحالات الإصابات تحسناً في جاهزية منطقة استقبال الإصابات وفريق العمل الطبي عقب تطبيق مسار للإخطار المسبق. وأظهرت دراسة لتحسين جودة الرعاية في قسم الطوارئ، شملت 307 مرضى، ارتباط تسليم المعلومات المتزامن بين أعضاء الفريق بتحسين سرعة إجراء الفحوصات التشخيصية واتخاذ قرارات تحديد الوجهة العلاجية للمريض. كذلك أبرزت الدراسات النوعية، والاستقصائية، والمحاكاة، ودراسات التحقق من صلاحية أدوات التواصل، وجود تفاوت في استخدام التنبيهات المسبقة، وغموض المسؤوليات، والمقاطعات أثناء التواصل، وفقدان بعض المعلومات، إلى جانب أهمية اعتماد أساليب منظمة لتسليم المرضى.

الخاتمة :يبدو أن التواصل بين خدمات الطوارئ الطبية وأقسام الطوارئ، عندما يتسم بالسرعة والدقة والقدرة على توفير معلومات قابلة للتطبيق، يسهم في تحسين الجاهزية التشغيلية وبعض مؤشرات العمليات العلاجية المرتبطة بالحالات الحرجة التي تتطلب تدخلاً سريعاً. ومع ذلك، لا تزال الأدلة المتعلقة بالتأثير المستقل لهذا التواصل في معدلات الوفيات، والوظائف الصحية على المدى الطويل، والأحداث السلبية التي يمكن الوقاية منها، متفاوتة وتعتمد إلى حد كبير على الدراسات الرصدية. وتستدعي معايير الإخطار المسبق الموحدة، والحد الأدنى من مجموعات البيانات، وتسليم المرضى بصورة تشاركية بين أعضاء الفريق، وأنظمة التغذية الراجعة، إجراء تقييم مستقبلي رسمي لقياس فعاليتها.

**الكلمات المفتاحية** :خدمات الطوارئ الطبية؛ التواصل قبل الوصول إلى المستشفى؛ الإخطار المسبق بوصول سيارة الإسعاف؛ جاهزية أقسام الطوارئ؛ تسليم المرضى؛ سلامة المرضى؛ مراجعة منهجية.

## 1. Introduction

The interface between emergency medical services (EMS) and hospital emergency departments (EDs) represents a high-consequence transition in care. Paramedics may identify critical illness, initiate treatment, collect trajectory-defining observations, and communicate anticipated needs before hospital arrival. Hospital teams must then transform the transmitted information into personnel deployment, resuscitation-space allocation, diagnostic preparation, specialty activation, and continuity of treatment. Failure at this interface can result in avoidable repetition of assessment, missed clinical changes, insufficient resources at reception, or delays to time-critical interventions [2,3].

Prehospital communication includes at least two related but distinct processes. Advance notification (also described as a pre-alert or prenotification) conveys an actionable warning before arrival; face-to-face handover transfers the patient history, physiological findings, interventions, outstanding concerns, and responsibility for ongoing care. An alert can provide time to assemble a trauma or stroke team, while handover quality influences whether those preparations translate into safe clinical decisions. Communication quality therefore has multiple dimensions: timeliness, accuracy, completeness, relevance, structure, closed-loop confirmation, and the receiving team's ability to act [3–5].

The strongest rationale for early communication arises in conditions in which each additional minute may affect the opportunity for definitive treatment. In suspected ischemic stroke, prenotification can trigger stroke-team assessment and accelerate brain imaging and thrombolysis. In suspected ST-elevation myocardial infarction (STEMI), the ambulance ECG and prehospital catheterization-laboratory activation can compress reperfusion pathways. Major trauma, sepsis, and undifferentiated critical illness present different needs, including resuscitation-space readiness, team activation, infection precautions, and anticipation of deterioration [6,10–13].

However, communication can impose costs as well as benefits. Alerts may compete for staff attention, especially in crowded EDs, and indiscriminate over-alerting can create fatigue. A technically complete message may still fail if the call is not documented or relayed to the relevant receiving team. Similarly, a standardized acronym does not compensate for incomplete physiological data, interruptions, uncertain transfer of responsibility, or an ED unable to mobilize resources [4,7–9].

The present paper asks whether higher-quality communication is associated with improved ED preparedness and patient-care outcomes, which aspects of communication appear most influential,

and how EMS organizations might operationalize the findings. The focus is the communication mechanism rather than a single disease pathway; this distinction allows evidence from disease-specific notification studies to be interpreted alongside organizational, qualitative, and handover research.

## 2. Review Objective and Questions

The primary objective is to evaluate the relationship between the quality of prehospital-to-ED communication and ED preparedness, efficiency, safety, and clinical outcomes. Secondary objectives are to identify communication practices associated with improved performance, describe barriers to reliable information transfer, and specify implications for ambulance systems and ED receiving teams.

How do pre-arrival notifications influence time-critical investigations, treatment, specialist activation, and readiness of ED facilities and personnel?

Which handover characteristics—structure, accuracy, physiological observations, timing, closed-loop acknowledgment, and leadership—appear to support better continuity of care?

How strong is the evidence that communication quality independently influences mortality, functional recovery, or adverse events rather than only intermediate process metrics?

What implementation and evaluation strategies are most applicable to integrated ambulance–hospital pathways?

## 3. Methods

### 3.1 Review design and reporting status

The intended design is a systematic review with narrative synthesis in accordance with PRISMA 2020 reporting recommendations [1]. The present document is an evidence-verified manuscript draft rather than a completed, independently reproducible systematic review. A targeted literature-identification exercise enabled verification of a set of relevant primary publications and extraction of reported findings; however, records from every planned database were not exported, duplicate records were not logged, and two-reviewer screening and formal risk-of-bias assessment have not yet been performed. The results below should therefore be interpreted as a preliminary evidence map, not a claim that all eligible studies have been captured. A reproducible search strategy appears in Appendix A.

### 3.2 Eligibility criteria

Eligible populations comprise adults or children receiving emergency ambulance transport to an ED or trauma center and the clinicians involved in receiving and transferring care. Eligible exposures include EMS prenotification or pre-alert calls, radio or digital transmission of clinical information, standardized verbal handover formats, synchronized team reports, and organizational measures intended to improve the information exchange. Comparators may involve no prenotification, usual practice, alternative message formats, or different communication processes.

Eligible study designs are randomized or quasi-experimental studies, prospective or retrospective observational studies, quality-improvement evaluations, cross-sectional process studies, qualitative investigations, and validated communication-measurement studies. Outcomes are grouped as (a) preparedness: team presence, resuscitation-bay availability, equipment and pathway readiness; (b) efficiency: door-to-imaging, door-to-treatment, diagnostic turnaround and ED disposition; (c) communication integrity: completeness, retained information, interruptions, and role clarity; and (d) patient-oriented outcomes: mortality, neurological function, complications, safety events and satisfaction. Editorials, expert opinions and reviews are used only as contextual sources and are not treated as original outcome studies.

### 3.3 Search strategy to complete

A comprehensive search should cover MEDLINE/PubMed, Embase, Scopus, Web of Science, CINAHL, and the Cochrane Library, supplemented by reference-list and forward-citation searches. An appropriate primary period is 1 January 2019 to 8 November 2026, with no language exclusion where translation is feasible. The Boolean search should combine prehospital or ambulance

terminology with communication, pre-alert, handover, ED readiness, patient safety, and treatment-time concepts; a reproducible PubMed string is supplied in Appendix A. Search dates, platform, exact strings, number of records exported, and database filters must be documented prior to submission.

### 3.4 Study selection and data extraction

Two reviewers should independently screen titles and abstracts, assess eligible full texts, and resolve disagreements by consensus or adjudication. A standardized extraction form should capture citation and country, population, setting, design, sample size, operational definition of communication, intervention or exposure, comparison, adjusted confounders, outcome measures, numerical findings, and author-reported limitations. Multiple publications from a shared research programme or overlapping patient records should be cross-referenced and not counted as independent patient cohorts in any synthesis.

### 3.5 Risk-of-bias and certainty assessment

Randomized studies should be assessed with RoB 2; nonrandomized intervention studies with ROBINS-I or an appropriate JBI critical appraisal tool; cohort and cross-sectional studies with design-matched JBI instruments; and qualitative studies with the JBI qualitative checklist or CASP. Two assessors should document domain-level decisions and reconcile differences. Certainty of evidence should be evaluated by outcome using GRADE, accounting for study limitations, inconsistency, indirectness, imprecision and publication bias. These assessments are proposed for the completed review; the current manuscript provides only a transparent discussion of design-related limitations.

### 3.6 Synthesis plan

Because alert pathways, comparator conditions, case mix, outcome units, and study designs vary substantially, narrative synthesis is the default. Where at least two clinically comparable studies provide adjusted estimates for the same outcome and follow-up window, a random-effects meta-analysis may be considered after assessment of between-study heterogeneity ($I^2$ and $tau^2$). No pooled estimate is calculated here. Differences in patient groups and reporting definitions should be explored in condition-specific analyses (stroke, STEMI, trauma, other critical illness) and by communication modality (prenotification, in-person handover, digital alert).

## 4. Results: Verified Preliminary Evidence Map

### 4.1 Scope and characteristics of the available evidence

Eleven primary reports were verified for this preliminary synthesis, spanning 2020–2025 and representing Australia/India, Iceland, Germany, Australia, Canada, the United Kingdom, South Korea, and the United States. Their designs included comparative cohort analyses, an implementation cohort, qualitative studies, a national survey, a large registry analysis, a simulation trial, a tool-validation study, and a quality-improvement evaluation. An additional 2026 mixed-methods report [14] corroborates contemporary implementation issues but overlaps with earlier UK research programme outputs and is therefore not treated as an independent patient cohort. These 11 verified reports are an evidence map, not an exhaustive PRISMA study-inclusion count.

*Table 1. Verified primary studies informing the preliminary synthesis (sorted by publication year).*

| Study | Setting/design | Communication focus | Reported finding |
|---|---|---|---|
| Mitra et al. 2020 [6] | India; before–after cohort; 471 trauma patients | Digital trauma prenotification | Trauma call-out RR 1.30; trauma-bay ready RR 1.47; team leader present RR 1.50. |
| Dúason et al. 2021 [3] | Iceland; 17 qualitative interviews | EMS–ED transfer processes | Ambiguous responsibility, weak structure and collaboration impeded reliable handover. |
| Golling et al. 2022 [5] | Germany; 38 observed handovers | ED-HFH quality tool | 133 ratings; internal consistency α=0.83; supports structured quality measurement. |
| Savage et al. 2023 [10] | Australia; cohort; 2,498 STEMI patients | Prehospital cath-lab activation | Door-to-balloon median 34 vs 86 min; lower observed 30-day cardiovascular mortality. |
| Cowan et al. 2023 [7] | Canada; 27 simulated trauma handovers | IMIST, ISOBAR versus ad-lib | Handover quality depended on vital signs, leadership and interruption control; format alone not significant. |
| Long et al. 2024 [8] | UK; 143 pre-alerts, 40 interviews | ED response to pre-alerts | Alerts aided practical/psychological readiness; poor dissemination and resource pressure created risk. |
| Coster et al. 2024 [9] | England; survey; 1,298 EMS clinicians | Alert criteria, format and training | Only 29% reported specific alert training; 50% had never received feedback. |
| Pilbery et al. 2025 [11] | UK; linked records; 1,363,274 conveyances | Predictors of pre-alert use | 142,795 (10.5%) alerted; variation persisted after adjustment for case mix. |
| Gross et al. 2025 [12] | USA; ED QI study; 307 patients | Synchronous team-based handoff | Time to CBC result 87 vs 68 min; to disposition 338 vs 283 min. |
| Jeong et al. 2025 [13] | South Korea; cohort; 1,107 stroke patients | EMS stroke prenotification | Imaging 27 vs 35 min; IV thrombolysis 50.5 vs 56.5 min. |
| Kimbrell et al. 2025 [4] | USA; cohort; 1,053 stroke/TIA patients | EMS stroke prenotification | Door-to-CT 18 vs 21 min; IV thrombolysis 52 vs 63 min (reported adjusted comparisons). |

*Abbreviations: RR, relative risk; ED-HFH, Emergency Department Human Factors in Handover; CBC, complete blood count; TIA, transient ischemic attack; IV, intravenous. These studies were not independently risk-of-bias scored for this draft.*

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### 4.2 Prehospital notification and ED readiness

A prospective before–after implementation evaluation in an Indian trauma centre (208 patients before and 263 after the intervention) examined an ambulance-to-ED notification application. The proportion of eligible patients arriving after notification increased from 0% to 11%, while the reported relative likelihood of a trauma call-out increased (RR 1.30, 95% CI 1.10–1.52). Trauma-bay readiness (RR 1.47, 95% CI 1.05–2.05) and trauma-team leader presence (RR 1.50, 95% CI 1.07–2.10) also improved [6]. These findings link a specific communication process to observable reception preparedness, although the nonrandomized before–after design cannot fully separate the intervention from secular changes.

An in-depth UK qualitative study involving 162 hours of observation, 143 pre-alerts and 40 interviews in six EDs found that alerts permitted both practical preparation (such as organizing space, staff and equipment) and psychological anticipation of urgent arrivals. Respondents also described substantial staff time devoted to calls, uncertainty over which patients merit pre-alerts, and a risk of information loss when incoming details were neither documented nor passed consistently to receiving clinicians [8]. The corresponding pre-alert mechanism is thus not a call alone; preparedness depends on acknowledgment, circulation of actionable information, and response capacity.

System-level variation was confirmed in a survey of 1,298 English ambulance clinicians [9]: only 29% reported dedicated pre-alert training and half said they had never received feedback. A separate linked-record cohort of 1,363,274 ED conveyances found pre-alert documentation for 142,795 (10.5%). Of these, 42,362 (30%) concerned diagnoses with recognizable pre-alert pathways. Patient acuity and working diagnosis explained much of the variation, but clinician, hospital and other nonclinical factors remained significant [11]. The latter study evaluates alert selection patterns, not a causal improvement in patient outcomes.

### 4.3 Stroke pathways and time to treatment

In a South Korean cohort of 1,107 adults with acute ischemic stroke, Jeong and colleagues [13] reported shorter process times with EMS prenotification: stroke pathway activation 10 versus 13.5 minutes, brain imaging 27 versus 35 minutes, intravenous thrombolysis 50.5 versus 56.5 minutes, mechanical thrombectomy 126.5 versus 151 minutes, and stroke-unit admission 270.5 versus 295.5 minutes. Multivariable modelling also favored prenotification for several treatment time measures. The estimates refer to association and do not prove that the communication act itself caused the differences.

Kimbrell and colleagues [4] examined 1,053 EMS-transported patients diagnosed with stroke or transient ischemic attack, of whom 637 received notification. Reported adjusted median door-to-CT time was 18 versus 21 minutes. Among patients given IV thrombolysis, corresponding medians were 52 versus 63 minutes. An apparent unadjusted benefit for endovascular thrombectomy timing did not persist after adjustment. Together, these observations support the role of early stroke-team mobilization but highlight outcome-specific sensitivity to confounding and pathway differences.

### 4.4 Cardiac activation and clinical outcomes

A retrospective analysis of 2,498 ambulance-transported STEMI patients undergoing primary percutaneous coronary intervention reported that 73% received prehospital catheterization-laboratory activation [10]. The median door-to-balloon interval was 34 minutes in the activated group compared with 86 minutes in the nonactivated group, and 30-day cardiovascular mortality was 1.6% versus 6.6%. The published analysis also reported an adjusted association between absence of activation and higher 30-day mortality (odds ratio 3.6, 95% CI 2.2–6.0) [10]. This is the clearest identified signal for both process and mortality outcomes, but its observational design permits residual confounding by patient selection, clinical severity, and parallel systems of care.

### 4.5 Handover structure, integrity and clinical efficiency

A US prospective quality-improvement evaluation compared usual opportunity-based handover with synchronous team-based reporting in 307 ED patients (248 usual care and 59 intervention) [12].

Team reporting brought the responsible medical and nursing team to the bedside for one shared ambulance report. Mean time to complete blood count order fell from 44 to 15 minutes, mean time to result from 87 to 68 minutes, and mean time to patient disposition from 338 to 283 minutes. The change in time to ED departure was not statistically significant (541 versus 525 minutes; p=0.71). Consequently, improvements in early clinical workflow should not automatically be interpreted as reductions in overall ED length of stay.

A single-blind randomized simulation trial of 27 paramedic-to-trauma-team handovers found no statistically significant difference in overall handover quality attributable to using either IMIST or ISOBAR rather than unstructured reporting [7]. Independent assessments nevertheless highlighted the importance of objective vital signs, leadership, concise logical sequence, interruption control and receiving-team summary. This suggests that a mnemonic is useful only when embedded in a wider communication environment that supports attention, prioritization and shared understanding.

In Icelandic interviews with 17 ambulance and ED professionals, unclear timing of responsibility transfer, limited standardization, and inconsistent interprofessional collaboration were identified as vulnerabilities [3]. A German validation study of 38 observed handovers developed the ED-HFH tool and reported acceptable internal consistency (Cronbach's $\alpha$=0.83), supporting systematic measurement of communication and human factors [5]. Neither study directly estimates mortality, but both contribute important insight into how handover quality can be operationalized and audited.

### 4.6 Outcomes not established by the available evidence

The studies identify reproducible process-level signals, but robust, independent measurement of patient-centred safety endpoints remains limited. Mortality was assessed in the STEMI cohort but is not a generalizable effect estimate for all pre-alerts. Qualitative and staff-survey findings identify plausible harm mechanisms—information loss, missed warnings and unclear accountability—without directly quantifying preventable adverse events. No defensible pooled estimate of mortality, neurological independence, diagnostic error or satisfaction can be generated from the currently mapped reports.

## 5. Discussion

### 5.1 Interpretation of principal findings

Across multiple conditions and study designs, communication appears most effective when it changes the receiving team's behavior before the patient arrives or immediately at handover. The proposed pathway is a sequence of accurate recognition, timely warning, message transmission, acknowledgment, mobilization of ED resources, a focused transfer of clinical facts, and timely definitive action. Interruption at any step can erode the value of earlier information. The evidence therefore supports treating EMS–ED communication as an integrated clinical pathway rather than a discrete telephone call or handover mnemonic.

The process improvements observed in stroke and STEMI are clinically plausible because advance warning can reduce time between arrival and activation of staff or specialist resources. The larger time difference reported for STEMI may reflect a pathway in which catheterization-laboratory teams require mobilization and can be activated before arrival; smaller stroke-imaging effects may reflect already optimized triage systems. Such comparisons are interpretive, not head-to-head trial findings [4,10,13].

In undifferentiated illness and trauma, the receiving team must balance the value of early preparation against over-alerting. Long and colleagues' qualitative findings [8] and the large UK variability analysis [11] caution against equating a higher pre-alert rate with better care. Alerts are valuable when they reliably identify patients requiring a specific action, include enough information to direct that action, and reach a receiver who is able to respond.

### 5.2 What defines high-quality communication?

The mapped studies suggest a practical minimum standard: clear patient identification; dispatch or incident context and mechanism when relevant; reason for alert; vital signs and trends rather than

isolated measurements; focused clinical concern; treatments already delivered; anticipated time of arrival; explicit request or required capability; and receiver acknowledgment. On arrival, the same information should be reconciled with the current assessment, medication and intervention record, and pending decisions. The verbal summary should occur with the appropriate ED clinician listening, minimizing interruptions whenever immediate resuscitation does not take priority [3,5,7,8].

Closed-loop communication should extend beyond repeating a message: the receiver should confirm the planned response and indicate when a specialist, resuscitation bay, isolation equipment or additional resource has been arranged. Explicitly naming the clinician who accepts responsibility reduces handover ambiguity. These are reasoned implementation implications supported by the mechanisms and barriers reported in the included primary literature, not claims that each measure has independently demonstrated a mortality benefit.

**5.3 Limitations and certainty of evidence**

Most outcome comparisons are nonrandomized; pre-alerted and non-pre-alerted patients may differ in severity, completeness of documentation, hospital capability, access to specialty teams, and journey characteristics. Confounding by indication can work in either direction: sicker patients may preferentially be pre-alerted, or more recognizable conditions may receive more complete pathway activation. Pre- and post-intervention studies are vulnerable to secular improvements, and quality-improvement designs may lack balanced intervention groups. The Gross evaluation, for instance, had substantially fewer intervention patients than controls [12].

Qualitative and survey investigations address mechanism, acceptability and work-system factors rather than treatment efficacy; a simulation trial measures communication behaviors rather than patient outcomes. Differences in whether “prehospital notification” refers to an attempted call, an acknowledged message, formal pathway activation, or a complete electronic package create additional indirectness. Several of the UK reports belong to an overlapping research programme and must not be combined as independent cohorts. No formal GRADE judgement is assigned without independent risk-of-bias appraisal and complete study selection [8,9,11,14].

A limitation of this manuscript is the provisional evidence-identification process. It does not supply audited database exports, full-text exclusion reasons, or a completed PRISMA flow chart. The conclusions intentionally avoid asserting that all relevant studies have been captured. These methodological requirements must be completed before labeling the document a finished systematic review for submission.

**5.4 Implications for Saudi Red Crescent Authority practice**

For ambulance services integrated with multiple receiving hospitals, standardization should emphasize a shared communication agreement rather than a single rigid script. The Saudi Red Crescent Authority (SRCA) could collaborate with ED and specialty leaders to define condition-sensitive pre-alert triggers, a minimum transmission dataset, and response expectations for stroke, acute coronary syndromes, major trauma, sepsis and deteriorating patients. Any local adaptation should consider language consistency, data privacy, travel time, network reliability and the diversity of public and private receiving hospitals.

A closed feedback loop is also necessary. Audit measures should include the percentage of clinically eligible cases pre-alerted; percentage of alerts containing vital signs, estimated arrival and a required action; number of alerts acknowledged; discrepancy between ambulance and ED understanding; completeness of face-to-face handover; time from alert to team readiness; and condition-specific treatment times. These metrics should be linked to nonpunitive training and case review and interpreted with patient case mix, ED crowding, and appropriateness of alerts in mind.

## 6. Practice Recommendations and Research Priorities

*Table 2. Practical communication framework proposed for ambulance–ED systems.*

| Stage | Operational recommendation | Process indicator |
|---|---|---|
| Recognition | Apply jointly agreed, condition-specific pre-alert criteria; capture severity and diagnostic uncertainty. | Eligible alerts issued; inappropriate or missed alerts. |
| Transmission | Share identity, working diagnosis, vital sign trends, treatments, ETA and specific request in a structured sequence. | Completeness of mandatory fields; time from decision to call. |
| Acknowledgment | Require a named ED receiver and closed-loop confirmation of the action planned. | Acknowledged alerts; messages handed onward to destination team. |
| At-bedside handover | Gather the receiving clinician(s), minimize avoidable interruption, include physiological reassessment, and identify transfer of responsibility. | Handover completeness; interruptions; receiving-team understanding. |
| Learning | Review selected cases and stratified outcome indicators with joint EMS–ED feedback. | Feedback coverage; trends in clinical process and safety measures. |

Future studies should compare standardized communication pathways with current practice in multicenter stepped-wedge or cluster-randomized designs where feasible, using pre-specified patient-oriented outcomes and process measures. Investigators should collect data on false-positive alerts and missed alerts, message accuracy, ED occupancy, transfer time, staff workload and communication failures, and should assess whether benefits differ by urban versus rural settings or destination hospital capability. Patient-level analyses should avoid double-counting overlapping registry populations and should report adjusted estimates with uncertainty intervals.

## 7. Conclusion

High-quality communication between prehospital clinicians and ED staff is a plausible and modifiable component of emergency-care system performance. Verified studies associate timely notification with improved readiness and faster stroke and STEMI pathways, while structured team handover has been associated with improvements in selected diagnostic and disposition intervals. The evidence is less definitive for long-term outcomes and direct reduction of preventable harm because many findings arise from observational, qualitative and process-focused designs. Developing standardized, actionable pre-alerts; protecting attention during handover; explicitly transferring responsibility; and returning feedback to EMS teams are justified implementation priorities. A complete systematic search, independent appraisal and PRISMA reporting are required before definitive evidence-certainty claims can be made.

**Declarations**

**Ethics approval:** Not applicable to the synthesis of publicly available published studies. No new human-participant data were collected for this manuscript.

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**Competing interests:** [Each author must provide a declaration before submission.]

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**Protocol registration:** No PROSPERO or OSF registration has been supplied or claimed for the present draft. Registration status must be reported accurately if a protocol is prospectively registered.
**Data availability:** Numerical findings in this manuscript are drawn from the cited published reports; search exports, screening decisions, and an extraction workbook must be archived after the systematic search is completed.

**References**

1. Page MJ, McKenzie JE, Bossuyt PM, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ. 2021;372:n71. https://doi.org/10.1136/bmj.n71
2. Troyer L, Brady W. Barriers to effective EMS to emergency department information transfer at patient handover: a systematic review. Am J Emerg Med. 2020;38(7):1494–1503. https://doi.org/10.1016/j.ajem.2020.04.036
3. Dúason S, Gunnarsson B, Svavarsdóttir MH. Patient handover between ambulance crew and healthcare professionals in Icelandic emergency departments: a qualitative study. Scand J Trauma Resusc Emerg Med. 2021;29:21. https://doi.org/10.1186/s13049-021-00829-x
4. Kimbrell J, Shekhar AC, Stebel J, et al. Prehospital notification in acute stroke: a retrospective cohort study. Proc (Bayl Univ Med Cent). 2025;38(5):622–625. https://doi.org/10.1080/08998280.2025.2514984
5. Golling M, Behringer W, Schwarzkopf D. Assessing the quality of patient handovers between ambulance services and emergency department: development and validation of the emergency department human factors in handover tool. BMC Emerg Med. 2022;22:10. https://doi.org/10.1186/s12873-022-00567-y
6. Mitra B, Kumar V, O'Reilly G, et al. Prehospital notification of injured patients presenting to a trauma centre in India: a prospective cohort study. BMJ Open. 2020;10:e033236. https://doi.org/10.1136/bmjopen-2019-033236
7. Cowan S, Murphy P, Kim M, et al. Paramedic to trauma team verbal handover optimization—a complex interaction. Can J Surg. 2023;66(3):E290–E297. https://doi.org/10.1503/cjs.013622
8. Long J, Sampson FC, Coster J, O'Hara R, Bell F, Goodacre S. How do emergency departments respond to ambulance pre-alert calls? A qualitative exploration of the management of pre-alerts in UK emergency departments. Emerg Med J. 2025;42(1):28–34 (first published online 2024). https://doi.org/10.1136/emermed-2023-213854
9. Coster JE, Sampson FC, O'Hara R, Long J, Bell F, Goodacre S. Variation in ambulance pre-alert process and practice: cross-sectional survey of ambulance clinicians. Emerg Med J. 2025;42(1):14–20 (first published online 2024). https://doi.org/10.1136/emermed-2023-213851
10. Savage ML, Hay K, Vollbon W, et al. Prehospital activation of the cardiac catheterization laboratory in ST-segment-elevation myocardial infarction for primary percutaneous coronary intervention. J Am Heart Assoc. 2023;12:e029346. https://doi.org/10.1161/JAHA.122.029346
11. Pilbery R, Sampson FC, Herbert E, et al. What factors predict ambulance prealerts to the emergency department? Retrospective observational study from three UK ambulance services. BMJ Open. 2025;15:e097122. https://doi.org/10.1136/bmjopen-2024-097122
12. Gross CL, Cowgill CD, Selph BA, et al. Prehospital to emergency department handoff: can team-based reporting improve markers of clinical efficiency in an adult emergency department? BMJ Open Qual. 2025;14:e002948. https://doi.org/10.1136/bmjoq-2024-002948
13. Jeong YJ, Kim KH, Park JH, Ro YS, Song KJ, Shin SD. Associations between prenotification and time to management in acute stroke patients transported by emergency medical services. J Emerg Med. 2025;74:77–85. https://doi.org/10.1016/j.jemermed.2025.02.005
14. Sampson FC, Long J, Coster J, et al. Exploring the use of pre-hospital pre-alerts and their impact on patients, ambulance service and emergency department staff: a mixed-methods study. Health Soc Care Deliv Res. 2026;14(9):1–46. https://doi.org/10.3310/GJFS4321

15. Tortosa-Alted R, Reverté-Villarroya S, Martínez-Segura E, López-Pablo C, Berenguer-Poblet M. Emergency handover of critical patients: a systematic review. Int Emerg Nurs. 2021;56:100997. https://doi.org/10.1016/j.ienj.2021.100997

**Appendix A. Reproducible Search Strategy for Review Completion**

Suggested MEDLINE/PubMed strategy (adapt syntax and controlled vocabulary for each database): (("Emergency Medical Services"[MeSH] OR prehospital[tiab] OR pre-hospital[tiab] OR ambulance*[tiab] OR paramedic*[tiab]) AND ("Patient Handoff"[MeSH] OR communicat*[tiab] OR handover*[tiab] OR handoff*[tiab] OR prealert*[tiab] OR pre-alert*[tiab] OR prenotification[tiab] OR pre-notification[tiab] OR "advance notification"[tiab]) AND ("Emergency Service, Hospital"[MeSH] OR emergency department*[tiab] OR trauma center*[tiab] OR hospital arrival[tiab]) AND (preparedness[tiab] OR readiness[tiab] OR mortality[tiab] OR "patient safety"[tiab] OR "time to treatment"[tiab] OR "clinical outcome*"[tiab] OR "door to"[tiab] OR workflow[tiab])) AND ("2019/01/01"[Date - Publication] : "2026/11/08"[Date - Publication])

Required audit fields: search date; database and platform; exact line-by-line string; filters; records found; records exported; deduplication approach and count; titles/abstracts screened; full texts requested, unavailable and assessed; exclusions with reasons; and distinct reports versus studies included. Report any registry search and protocol amendments. Include the populated PRISMA 2020 flow diagram only after reconciling these fields.