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The Impact of Language and Cultural Barriers on Prehospital Emergency Care During International Mass Gatherings: A Systematic Review

أثر الحواجز اللغوية والثقافية على الرعاية الإسعافية قبل المستشفى خلال التجمعات البشرية الدولية الكبرى: مراجعة منهجية

Azzam Mohammed Alqurashi[1], Bandar Dakhilallah Alharthi[1], Sultan Abdullah Althomali[1], Fayez Ali Althomali[1], Rakan Mansour Alhousseni[2], Ahmed Mahmoud Altowairqi[1], Helal Saud Alqurashi[1], Mansour Farhan Algethami[1]

عزام محمد القرشي[1]، بندر دخيل الله الحارثي[1]، سلطان عبدالله الثمالي[1]، فايز علي الثمالي[1]، راكان منصور الحسيني[2]، أحمد محمود الطويرقي[1]، هلال سعود القرشي[1]، منصور فرحان القحطاني[1]

[1] Emergency Medical Services Technician, Saudi Red Crescent Authority, Saudi Arabia
[2] Paramedic, Saudi Red Crescent Authority, Saudi Arabia

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Abstract:

Background. International mass gatherings bring together participants who differ in language, cultural expectations and familiarity with host-country emergency systems. In prehospital care, language discordance may undermine emergency call-taking, symptom assessment, consent, clinical instructions and interagency coordination. The Hajj pilgrimage offers a particularly relevant setting in which crowd density and multilingual patient encounters occur simultaneously.
Objective. To examine published evidence on the relationship of language and cultural barriers to prehospital emergency care access, communication, safety and operational efficiency during international mass gatherings, with particular attention to Hajj and transferability from other EMS systems.
Methods. This manuscript follows the structure of the supplied systematic-review reference and develops an evidence-grounded narrative synthesis of 11 identifiable primary publications. Four are Hajj-setting investigations and seven provide related prehospital/dispatch evidence from other countries. Studies were grouped by setting and outcome; design-specific JBI appraisal domains were mapped. Because original database exports and a complete screening log were not supplied, an auditable PRISMA study-selection count and final study-level risk-of-bias ratings are not asserted.
Results. Hajj studies identify language discordance, difficulty obtaining histories, crowd access constraints, and culturally sensitive clinical interactions as operational concerns. Evidence from other EMS settings demonstrates delayed dispatch allocation during language-discordant calls, missed information in cardiac-arrest calls, and greater reported preparedness after training. A small nonrandomized translation-app study reported better paramedic-rated communication. These findings do not establish a pooled effect on Hajj mortality or transport outcomes.
Conclusion. Communication support should be incorporated into mass-gathering EMS design through multilingual access routes, rapidly available professional interpretation, culturally responsive training and measurable handover standards. Prospective Hajj-specific studies are needed to establish whether these approaches improve objective patient outcomes.
Keywords: mass gatherings; Hajj; emergency medical services; prehospital care; language barriers; cultural competence; interpreters; patient safety; systematic review.

الملخص:

الخلفية :تشهد التجمعات البشرية الدولية الكبرى مشاركة أفراد ينتمون إلى خلفيات لغوية وثقافية متنوعة، وتتباين لديهم التوقعات الثقافية ومدى إلمامهم بأنظمة الطوارئ المعمول بها في الدولة المضيفة. وفي سياق الرعاية الإسعافية قبل المستشفى، قد يؤدي الاختلاف اللغوي إلى إعاقة تلقي البلاغات الطارئة، وتقييم الأعراض، والحصول على الموافقة المستنيرة، وإيصال التعليمات السريرية، والتنسيق بين الجهات المعنية. ويُعد موسم الحج مثالاً بارزاً على هذه البيئة، حيث تتزامن الكثافة البشرية المرتفعة مع تعدد لغات المرضى وتنوع خلفياتهم الثقافية.
الهدف :دراسة الأدلة المنشورة المتعلقة بالعلاقة بين الحواجز اللغوية والثقافية وبين إمكانية الوصول إلى خدمات الطوارئ الإسعافية قبل المستشفى، وفاعلية التواصل، وسلامة المرضى، والكفاءة التشغيلية خلال التجمعات البشرية الدولية الكبرى، مع إيلاء اهتمام خاص بموسم الحج، والاستفادة من مدى قابلية تعميم النتائج المستخلصة من أنظمة الخدمات الطبية الطارئة في بلدان أخرى.
المنهجية :تتبع هذه المخطوطة الهيكل التنظيمي للمرجع المقدم للمراجعة المنهجية، وتستند إلى توليف سردي للأدلة المنشورة، يشمل 11 دراسة أولية أمكن تحديدها والتحقق من بياناتها. من بينها أربع دراسات أُجريت في سياق الحج، وسبع دراسات تناولت جوانب ذات صلة بخدمات الإسعاف والطوارئ قبل المستشفى أو أنظمة استقبال البلاغات وتوجيهها في بلدان أخرى. وصُنفت الدراسات وفقاً لبيئة الدراسة والنتائج محل البحث، مع مواءمة مجالات التقييم النقدي للدراسات مع المجالات ذات الصلة بأدوات معهد جوانا بريغز .(JBI) ونظراً لعدم توفر ملفات التصدير الأصلية لقواعد البيانات وسجل مكتمل لعملية فرز الدراسات، لم يتم تقديم أعداد قابلة للتدقيق لمراحل اختيار الدراسات وفق مخططPRISMA ، كما لم تُحدَّد درجات نهائية لتقييم مخاطر التحيز على مستوى كل دراسة.
النتائج :تكشف الدراسات التي تناولت موسم الحج عن وجود تحديات تشغيلية مرتبطة بالاختلافات اللغوية، وصعوبة الحصول على التاريخ المرضي، والقيود المتعلقة بالوصول إلى المرضى في مناطق الازدحام، فضلاً عن التفاعلات السريرية التي تتطلب مراعاة الخصوصية والحساسيات الثقافية. وفي المقابل، تُظهر الأدلة المستمدة من أنظمة خدمات الإسعاف والطوارئ في بلدان أخرى أن الاختلاف اللغوي أثناء المكالمات الطارئة قد يؤدي إلى تأخر تصنيف البلاغات وتوجيه الموارد الإسعافية، وفقدان بعض المعلومات

المهمة أثناء مكالمات الإبلاغ عن حالات توقف القلب. كما تشير النتائج إلى ارتفاع مستوى الاستعداد المُبلّغ عنه عقب تلقي التدريب المتخصص. وأظهرت إحدى الدراسات الصغيرة غير العشوائية، التي لم تُستخدم فيها تطبيقات الترجمة بصورة عشوائية، تحسناً في تقييم المسعفين لفاعلية التواصل. ومع ذلك، لا تثبت هذه النتائج وجود تأثير كمي مجمّع للحواجز اللغوية والثقافية على معدلات الوفيات أو نتائج نقل المرضى خلال موسم الحج.
الخاتمة :ينبغي إدماج وسائل دعم التواصل ضمن منظومة التخطيط للخدمات الطبية الإسعافية خلال التجمعات البشرية الكبرى، وذلك من خلال توفير قنوات اتصال متعددة اللغات، وإتاحة خدمات الترجمة الفورية المتخصصة وسريعة الوصول، وتنفيذ برامج تدريبية تراعي التنوع الثقافي، ووضع معايير قابلة للقياس لتسليم الحالات ونقل المعلومات الطبية بين مقدمي الرعاية. كما تبرز الحاجة إلى إجراء دراسات مستقبلية استباقية مخصصة لموسم الحج، بهدف التحقق من مدى إسهام هذه التدخلات في تحسين النتائج السريرية الموضوعية للمرضى.

الكلمات المفتاحية :التجمعات البشرية الكبرى؛ الحج؛ خدمات الإسعاف والطوارئ الطبية؛ الرعاية قبل المستشفى؛ الحواجز اللغوية؛ الكفاءة الثقافية؛ المترجمون؛ سلامة المرضى؛ المراجعة المنهجية.

1. Introduction

International mass gatherings are characterized by the temporary convergence of large populations, intense demand for public services and substantial variation in visitors' familiarity with local systems. At religious events such as Hajj, clinical responders operate within dense crowds, time-dependent movement patterns, difficult access routes and demanding environmental conditions. These operational realities can intersect with differences in language, cultural norms and expectations of healthcare, making communication a core component of prehospital safety rather than an optional courtesy.

The first interaction with an emergency medical service may occur well before an ambulance arrives. Call-takers must identify the caller's location, recognize the nature and severity of illness, select an appropriate response, and convey clear instructions. When callers and dispatchers do not share a functional language, symptoms may be incompletely described and key details can be misunderstood. Meischke et al. (2013) observed longer dispatch-assignment times in calls with language barriers, suggesting that problems begin at system entry rather than only during bedside assessment.

After dispatch, paramedics must establish a history, seek permission where possible, explain procedures and formulate transport decisions under time pressure. Stadeli et al. (2023) found that EMS professionals caring for patients with limited English proficiency perceived ineffective interpretation, cultural differences and distrust as obstacles to clinical communication. The authors also reported a tendency toward cautious transport when uncertainty could not be resolved. Such findings raise questions about both safety and resource use but are based on clinicians' accounts rather than direct causal outcome estimates.

The pilgrimage setting introduces additional considerations. Leggio et al. (2016) documented language barriers and difficulties reaching patients among Saudi EMS students supporting Hajj. Al Ruwaithi et al. (2026) identified language discordance, inadequate medical-history information and interagency coordination as prominent concerns among Hajj responders. Alrabie et al. (2026) similarly described cultural competence, patient preferences and communication challenges among healthcare professionals preparing for Hajj-related care.

Cultural barriers should not be reduced to nationality or religion. In clinical encounters they may involve expectations of family participation, gender-sensitive examination, perceptions of urgency, requests to continue religious activities, or differences in the language used to describe pain and distress. Respectful questioning and shared decision-making are required without assuming that any particular individual follows a group norm. These issues become especially consequential when crowd movement, noise and clinical urgency restrict the opportunity to clarify misunderstanding.

Although empirical work is growing, the evidence is distributed across studies of Hajj medical operations, dispatch communication, limited-language-proficiency care and small intervention

pilots. Results from routine EMS services cannot automatically be generalized to international mass gatherings. This review therefore separates directly setting-relevant evidence from supporting work and examines practical communication mechanisms, methodological weaknesses and research priorities.

1.1 Research Objectives

Identify language- and culture-related barriers reported by responders and patients during Hajj and comparable international mass gatherings.
Describe associations between language discordance and EMS access, dispatch efficiency, clinical assessment, treatment communication and safety indicators.
Examine evidence regarding interpreter access, multilingual communication tools, staff preparation and culturally responsive care.
Differentiate direct Hajj evidence from evidence derived from routine prehospital EMS systems.
Identify methodological gaps and recommendations for mass-gathering service design and future research.

1.2 Research Questions

The central question was: How do language and cultural barriers affect the delivery and quality of prehospital emergency care during international mass gatherings?
Which communication difficulties are described by frontline EMS professionals and gathering attendees?
What measured dispatch, assessment, care-process or patient-safety outcomes are associated with language barriers?
Which communication interventions have been evaluated and which remain policy proposals?
How transferable is evidence from non-gathering EMS systems to Hajj and similar events?

2. Methodology

2.1 Study Design

This manuscript was developed as a systematic-review-structured narrative synthesis addressing linguistic and cultural barriers in prehospital emergency care. The reporting organization follows the key domains of PRISMA 2020 (Page et al., 2021). Its empirical evidence table is a verifiable, topic-relevant publication set rather than a claim of exhaustively screened studies: the original search protocol, database export files and review-team screening records were not provided with the title and author-list source files. Accordingly, study counts describe the publications analyzed here, not the yield of an independently reproducible systematic search.

2.2 Search Strategy and Information Sources

Bibliographic identification for the manuscript used accessible journal abstracts, publisher records and PubMed-indexed publications relating to Hajj mass gatherings, ambulance services, limited-language proficiency, interpreter use, emergency dispatch and cultural communication. PubMed/MEDLINE, Scopus, Web of Science, CINAHL and Embase are appropriate databases for the final reproducible search; Appendix B supplies planned database-adapted strategies. Exact historical database execution dates and total retrieved records cannot be reconstructed from the supplied materials.

The core search concept is: (prehospital OR paramedic OR emergency medical services OR ambulance OR emergency dispatch) AND (language barrier OR language discordance OR interpreter OR cultural competence OR cultural barrier) AND (mass gathering OR Hajj OR pilgrimage OR international event). A broader linked search without the final gathering term is necessary because directly relevant Hajj studies are sparse. Searches should capture title/abstract keywords and controlled vocabulary; the full strategy must be dated, exported and deduplicated before any final PRISMA totals can be reported.

2.3 Eligibility Criteria

The target population included prehospital EMS professionals, emergency call-takers, and people seeking urgent care at international mass gatherings. Direct evidence concerned Hajj or comparable mass-gathering sites, while supporting evidence included prehospital systems with multilingual or limited-proficiency patient encounters. Original qualitative, cross-sectional, cohort, dispatch-record and nonrandomized intervention studies were considered; relevant peer-reviewed publications available by 3 November 2026 were mapped. Articles limited to inpatient communication, editorials without primary findings, and studies without a plausible prehospital or mass-gathering communication link were not treated as primary evidence.

Eligibility distinguished directness from quality. A Hajj public-health communication survey was retained as contextual gathering evidence, not as an EMS patient-outcome study. Likewise, dispatch and paramedic studies conducted in the United States, Australia and Germany were used to explain plausible mechanisms and evaluated interventions but not to estimate a Hajj-specific effect. Earlier narrative reviews and PRISMA/JBI methodological publications were used for context rather than counted as primary studies.

2.4 Study Selection and Reporting

Eleven distinct primary papers were identified and narratively examined: four from Hajj/pilgrimage contexts and seven from non-gathering EMS or dispatch environments. These are candidate publications verified for this manuscript, not a documented denominator of all studies satisfying prespecified database search criteria. The supplied attachments did not contain dated search exports, a duplicate-removal report, title/abstract decisions, full-text exclusion reasons or an included-study citation log. The PRISMA documentation template in Appendix A therefore records these fields as not established, without generating artificial screening numbers.

2.5 Data Extraction

For each candidate study, the extracted elements were citation/year, location and population, design and approximate sample where verified, communication barrier or intervention, main relevant finding, and limitations in transferability. We separated directly measured response times, CPR process measures and communication scores from qualitative themes or self-reported preparedness. Sample sizes and numerical effect estimates were retained only when reported by the identified publication. Patient outcomes were not pooled across dissimilar populations and study designs.

2.6 Methodological Quality and Risk of Bias

Appraisal domains were selected in accordance with study design using JBI guidance for qualitative research, analytical cross-sectional studies, cohort research and quasi-experimental designs. Qualitative studies were considered in terms of sampling, researcher influence, coherence of methods and adequacy of supporting data; surveys in terms of selection bias, measures and confounding; cohort studies in terms of comparability, exposure ascertainment and follow-up; and the app pilot in terms of nonrandom allocation, group imbalance and outcome measurement. Table 2 maps observable concerns and necessary checks. Formal JBI item-by-item Yes/No/Unclear scoring was not substituted by invented percentage scores.

2.7 Data Synthesis

A narrative synthesis was organized into four pathways: (1) communication at first contact and dispatch; (2) on-scene assessment and care decisions; (3) cultural context and Hajj operational constraints; and (4) interventions and workforce readiness. The grouping was chosen because heterogeneous qualitative evidence, process studies and observational comparisons cannot be combined meaningfully into a single numerical pooled effect. Where available, relative or absolute measures are attributed to their specific source and setting.

2.8 Ethical Considerations

This synthesis uses published information and includes no new patient recruitment or identifiable patient data. Ethical reporting requires accurate attribution, avoidance of cultural stereotyping, and clear separation between the effects measured by a study and possible mechanisms inferred from it.

Language proficiency should be treated as a contextual communication need, not as a deficiency of patients or a substitute for clinical risk assessment.

2.9 Methodological Boundaries

The strength of the conclusions is constrained by few direct mass-gathering studies, reliance on subjective experience in several studies, nonrandom sampling and the absence of a verified exhaustive review audit trail. Associations from dispatch studies do not prove the same magnitude of delays at Hajj, and qualitative reports of barriers do not establish increased mortality. Recommendations are therefore presented as evidence-informed service priorities rather than proven mass-gathering interventions.

3. Results

3.1 Characteristics of the Evidence

The evidence map comprises 11 identifiable original studies published from 2013 to 2026. Four relate to Hajj or its pilgrims; seven concern prehospital response, emergency dispatch or EMS clinician preparedness in other countries. The studies use qualitative interviews/focus groups, surveys, dispatch-record comparisons, retrospective patient cohorts, recorded-call analysis and a nonrandomized translation-tool pilot. Table 1 presents the principal study characteristics; it does not imply an exhaustive PRISMA set.

Table 1. Characteristics and findings of 11 topic-relevant original publications

Study	Setting / participants	Design	Relevant findings	Applicability
Al Ruwaithi et al. (2026)	Saudi Arabia; Hajj; 26 EMS interviews plus 7 key informants	Qualitative responder interviews	Language barriers, missing histories and traffic controls complicated EMS delivery; interagency planning was central.	Direct Hajj EMS
Alrabie et al. (2026)	Saudi Arabia; Hajj; 17 healthcare professionals	Qualitative interviews	Communication and leadership gaps; language and cultural considerations in clinical encounters.	Direct Hajj, multiprofessional
Leggio et al. (2016)	Saudi Arabia; EMS students at Hajj	Qualitative focus groups	Responders described language barriers and crowd-related difficulties reaching patients.	Direct Hajj, students
Taibah et al. (2020)	Saudi Arabia; 245 pilgrims surveyed in Makkah	Cross-sectional pilgrim survey	Language obstacles affected health information/protective actions; approximately 48% adopted all five measures.	Hajj public-health context, not EMS outcome

Study	Setting / participants	Design	Relevant findings	Applicability
Meischke et al. (2013)	United States; EMS dispatch calls	Observational dispatch-call analysis	Language-barrier calls had longer BLS and ALS assignment times; interpreter connection contributed to delay.	Non-Hajj dispatch
Sanko et al. (2021)	United States; 597 cardiac-arrest calls	Before-after dispatch cohort	Among limited-English-proficiency callers, dispatcher-assisted CPR was more frequent after a dispatch-system change (69% vs 28%).	Non-Hajj dispatch intervention
Stadeli et al. (2023)	United States; 39 EMS personnel in 8 focus groups	Qualitative focus groups	Ineffective interpretation, cultural differences and distrust were perceived obstacles to care.	Non-Hajj on-scene EMS
Müller et al. (2023)	Germany; 22 app users, 112 language-barrier controls	Nonrandomized pilot	Fixed-phrase app associated with higher paramedic-rated communication quality; small, nonrandom groups.	Non-Hajj tool evaluation
Perera et al. (2025)	Australia; 33 language-barrier cardiac-arrest calls	Qualitative conversation analysis	Call-takers sometimes missed vital information due to unrecognized misunderstanding.	Non-Hajj dispatch
Joshi et al. (2025)	United States; 6,146 adult cardiac arrests; 204 with language barrier	Retrospective cohort	Slower recognition and assisted CPR, but no detected survival-to-discharge difference in this cohort.	Non-Hajj cardiac arrest
Melgoza et al. (2026)	United States; 986 EMS clinician survey respondents	Cross-sectional survey	44.3% reported interpreter access; LEP-care education associated with greater self-rated preparedness.	Non-Hajj workforce

3.2 Methodological Quality and Risk of Bias

Differences in research design create distinct limitations. Hajj interviews offer strong contextual insight but cannot independently quantify causal effects on dispatch time or mortality. Surveys of pilgrims and clinicians rely on respondent recall, and their samples may not represent all attendees or responders. Administrative dispatch cohorts offer more objective process measurement, but language-barrier coding may be incomplete and clinical case mix may confound comparisons. The translation-app pilot provides an intervention signal but not randomized proof. Table 2 identifies the appropriate design-specific JBI appraisal tool and source-supported issues.

Table 2. Design-specific JBI appraisal mapping and principal methodological issues

Publications	Relevant JBI tool	Appraisal focus; complete item-level ratings not established
Al Ruwaithi 2026; Alrabie 2026; Leggio 2016	Qualitative research checklist	Purposive/volunteer selection, researcher reflexivity, transferability, depth of supporting quotations; responder perceptions rather than measured clinical events.
Stadeli 2023; Perera 2025	Qualitative research checklist	Focus-group dynamics or conversation-sample selection; coding transparency; contextual interpretation; no direct causal effect estimate.
Taibah 2020; Melgoza 2026	Analytical cross-sectional checklist	Convenience/voluntary response, measurement validity, self-report, nonresponse bias and confounding; limited causal inference.
Meischke 2013; Joshi 2025	Cohort/analytical observational checklist	Exposure classification for language barrier, patient severity differences, missing calls, co-interventions and outcome ascertainment.
Sanko 2021	Quasi-experimental/cohort checklist	Uncontrolled calendar changes, selection of available recordings, system-wide co-interventions and subgroup size.
Müller 2023	Quasi-experimental checklist	Nonrandom allocation, 22 intervention patients, subjective primary outcome, group imbalance and imprecision.

3.3 Main Findings of the Review

3.3.1 Communication Barriers in Hajj Mass-Gathering EMS

The most directly applicable field evidence comes from Hajj responders. In their study of 2019 Hajj operations, Al Ruwaithi et al. (2026) used 26 semi-structured interviews and seven key-informant interviews and identified language barriers alongside incomplete medical histories, non-emergency demand and movement restrictions. Their analysis places communication within a broader operational system: even an effective interpreter cannot remedy a delayed ambulance if interagency access arrangements fail. Conversely, streamlined routes do not ensure accurate assessment if responders cannot establish symptoms, medications or consent.

Leggio et al. (2016) described the experiences of EMS students providing support during Hajj. Participants considered the setting beneficial for clinical training but cited language barriers and difficulty reaching patients in dense crowds. Their observations help identify operational challenges encountered by inexperienced responders, although the sample is not representative of the entire Saudi Red Crescent workforce and does not provide measured adverse-event rates.

Alrabie et al. (2026) interviewed 17 healthcare professionals, including paramedics, physicians and nursing educators. Respondents described communication and leadership difficulties, limited preparedness and cultural challenges. Their accounts included difficulty communicating with pilgrims from multiple nationalities and concerns about patient choices that conflicted with clinical recommendations. These findings underline the need to combine language access with sensitive explanation, documentation and interprofessional coordination. They are not evidence that a particular culture is less compliant with emergency care.

Taibah et al. (2020) provides attendee-side context rather than a direct prehospital comparison. In a survey of 245 pilgrims, approximately 48% reported adoption of all five specified health-protective measures, and language barriers were among impediments identified. The finding supports attention to multilingual health communication before and during an event, but it cannot be used to estimate the number of ambulance-related errors or complications among pilgrims.

3.3.2 Emergency Call-Taking, Dispatch and Recognition

A dispatch-focused observational study by Meischke et al. (2013) found that language-barrier calls took, on average, 33% longer to basic life support assignment and 43% longer to advanced life support assignment than calls without a language barrier. Interpreter connection itself contributed to the observed differences, with about 49 seconds reported between operator connection and interpreter connection. These relative time differences apply to the study's United States dispatch system, not to Hajj emergency calls, but they reveal a plausible system bottleneck.

Perera et al. (2025) analyzed recordings and transcripts of 33 Australian language-discordant ambulance calls involving cardiac arrest. Callers sometimes conveyed clinically important information that call-takers did not recognize because it appeared outside expected conversational sequences. This suggests that simply asking whether a translator has been connected may not be sufficient: dispatch protocols should also encourage verification of the emergency problem and active clarification of information that has been provided but not understood.

Joshi et al. (2025) studied 6,146 out-of-hospital cardiac arrests, of which 204 involved a recorded language barrier. Compared with calls without a barrier, the language-barrier group had longer median times to cardiac-arrest recognition (2.0 versus 1.0 minutes) and assisted bystander CPR (2.2 versus 1.1 minutes). Bystander CPR was lower (75% versus 89%), although survival to discharge did not differ significantly (18% versus 17%). This distinction matters: demonstrable early-process disparities did not translate into a detectable mortality difference in this particular cohort.

3.3.3 On-Scene Assessment, Trust and Cultural Context

The eight focus groups in Stadeli et al. (2023) included 39 EMTs and paramedics. Participants identified inadequate interpretation, uncertainty about illness severity, trust, perceived bias and cultural differences as factors affecting encounters with people with limited English proficiency. Several reported selecting hospital transport more readily where incomplete history created concern

about unrecognized risk. Such cautious decision-making may protect some patients but could also alter service utilization; the study did not establish the downstream frequency of unnecessary transport or missed diagnoses.

At mass gatherings, the clinical significance of communication is heightened by limited access to historical records, separation from family companions, noisy environments, heat and fatigue, and restricted time for extended discussion. A culturally responsive assessment should determine the individual patient's preferred language, seek reliable interpretation, ask about any privacy or examination concerns and document the communication method used. Relatives or bystanders may provide immediate contextual assistance, but professional interpretation is preferable for high-stakes decisions when feasible because accuracy and confidentiality remain important.

3.3.4 Interpreter Access, Translation Tools and Training

Müller et al. (2023) evaluated a fixed-phrase multilingual app in German paramedic care. The pilot compared 22 patients for whom the app was used with 112 patients with limited German proficiency in a control group, alongside a German-speaking comparison group. App use was associated with an increase of 0.7 points in perceived communication quality on a five-point scale (P = .03); adjusted analysis reported an increase of 0.9 points (95% CI 0.2–1.6). However, the intervention was nonrandomized, small and judged primarily by clinicians. It did not establish an improvement in patient survival or prove that an app can safely replace an interpreter.

Sanko et al. (2021) compared 597 emergency cardiac-arrest calls under two dispatch systems in Los Angeles. Among callers with limited English proficiency, telecommunicator-assisted CPR occurred in 28% under the earlier protocol and 69% after the tiered dispatch system was introduced. The observational before-after comparison suggests that system-level changes may improve language-sensitive emergency instruction, but additional changes over time and small LEP subgroups limit causal interpretation and transferability.

In a national cross-sectional survey of 986 United States EMS clinicians, Melgoza et al. (2026) found that 28.8% reported initial education about care for patients with limited English proficiency and 44.3% reported access to professional interpreters. Initial education was associated with higher self-reported preparedness (OR 1.96, 95% CI 1.46–2.63). These are workforce perceptions, not measured competency scores; nevertheless, they identify concrete implementation targets for EMS training and interpreter availability.

Taken together, intervention evidence is promising but incomplete. Different tools address different tasks: language selection and emergency recognition at call-taking; standardized translated instructions at the scene; professional interpretation for complex history, consent and refusal; and culturally responsive training for clinician-patient interactions. An integrated workflow is likely more practical than assuming one technology can resolve all barriers, but such an integrated approach remains to be prospectively evaluated in Hajj EMS.

3.4 Summary of Results

Table 3 distinguishes measured effects from contextual and proposed effects. The principal finding is consistent across settings: communication difficulties are credible EMS process risks. However, direct Hajj-specific evidence largely concerns reported experiences and operational observations, while stronger quantitative process measures originate outside mass gatherings.

Table 3. Evidence strength and limits of inference by outcome domain

Outcome	Supported observation	What cannot be concluded
Hajj access and assessment	Responders reported language barriers, incomplete histories and crowd/interagency constraints (Al Ruwaithi; Alrabie; Leggio).	A numerical causal effect on Hajj response times, mortality or diagnostic error cannot be derived.
Emergency dispatch	Measured delays in dispatch assignment and earlier cardiac-arrest steps occurred in non-Hajj language-discordant systems (Meischke; Joshi).	Reported relative delays cannot be transferred unchanged to Saudi Hajj dispatch.
Clinical communication	EMS focus groups described interpretive uncertainty, distrust and cautious conveyance decisions (Stadeli).	The rate of unsafe conveyance or avoidable admission cannot be estimated.
Interventions	An app pilot improved provider-rated communication; a dispatch redesign was associated with better assisted CPR (Müller; Sanko).	Neither intervention has proven superiority for Hajj patient-centered outcomes.
Workforce readiness	LEP education was associated with higher perceived clinician preparedness (Melgoza).	Improved preparedness ratings are not equivalent to fewer adverse clinical events.

4. Discussion

4.1 Interpretation of the Main Findings

The collective evidence indicates that language and cultural barriers can affect multiple stages of the prehospital pathway. Emergency calls may be delayed by unsuccessful information exchange; paramedics may struggle to obtain a clinical history or explain treatment; and responders in Hajj may face additional constraints from large moving crowds and interagency access policies. These pathways interact, but no source reviewed establishes that language barriers alone explain a measurable proportion of Hajj emergency mortality or hospital admissions.

An important distinction is the difference between inability to communicate and inability to deliver clinical care. Objective vital signs, careful examinations and standardized assessment protocols can help clinicians reduce uncertainty while interpretation is arranged. Yet no set of vital signs can fully substitute for a history about onset, symptoms, medication, allergies or patient preferences. A resilient service therefore requires both structured assessment and access to effective communication mechanisms.

The finding from Joshi et al. (2025) that early CPR process measures differed whereas survival did not show a significant difference illustrates why conclusions should not be oversimplified. Absence of a detected difference in a specific outcome, particularly in a comparatively small language-barrier subgroup, does not mean dispatch communication is unimportant. Likewise, reports of difficulty from qualitative Hajj studies identify improvement targets but not evidence of a definitive causal patient harm.

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4.2 Comparison with Previous Literature

The Hajj observations of Leggio et al. (2016), Al Ruwaithi et al. (2026) and Alrabie et al. (2026) align with broader prehospital findings from Stadeli et al. (2023) about unreliable interpretation and uncertainty in care decisions. The shared theme is that language needs are rarely an isolated feature of the encounter: they overlap with patient acuity, environmental stress and resource limitations.

Quantitative dispatch studies allow a more precise operational perspective. Meischke et al. (2013) demonstrated longer assignment times, while Sanko et al. (2021) described substantial changes in dispatcher-assisted CPR following redesign of the dispatch workflow. These results reinforce the value of system-level preparation, particularly during predictable mass gatherings when planners can anticipate likely language needs and train the service before peak demand.

The findings from Müller et al. (2023) suggest that standardized technology can improve some elements of communication, but other research cautions against assuming a tool has eliminated misunderstanding. Translation quality, connection speed, culturally appropriate explanations and confidentiality all matter. The most appropriate communication approach depends on whether the task is immediate location confirmation, a brief symptom question, complex consent or communication with a receiving facility.

4.3 Implications for Saudi Red Crescent Authority and Mass-Gathering EMS

Mass-gathering preparedness should include language planning in the same operational documents as ambulance positioning, radio systems, patient flow and interagency coordination. During Hajj, multilingual access protocols could prioritize accurate location collection, recognition of red-flag symptoms and swift access to interpreter support in high-frequency languages identified from actual event data. These are recommendations informed by evidence; their clinical effectiveness should be tested rather than assumed.

Create a multilingual dispatch protocol with early language identification, short standardized emergency questions and rapid interpreter connection targets.

Place professionally interpreted or validated multilingual clinical phrases on approved, securely managed devices, with explicit limits on their use for informed consent and complex decisions.

Use simulated high-density crowd scenarios to train EMTs and paramedics in cultural humility, clarification, teach-back, privacy and respectful management of conflicting care preferences.

Coordinate EMS, security, transport and receiving hospitals so language needs and critical handover information are not lost at access checkpoints or transfer points.

Audit interpreter connection time, dispatch accuracy, time to first clinical assessment, documented communication method, patient understanding and adverse events with appropriate case-mix adjustment.

Any cultural-competence training should avoid fixed assumptions about religious or national groups. A patient's autonomy, confidentiality and need for appropriate urgency remain central. When a patient's decision seems at odds with recommended care, clinicians should first determine whether the explanation was understood, whether an interpreter is required, whether there are decision-making or capacity concerns, and what values or practical constraints the patient identifies.

4.4 Strengths and Limitations of the Evidence

This manuscript integrates direct Hajj field studies with measured prehospital communication outcomes and intervention evaluations, thereby avoiding the common mistake of treating all language-barrier studies as if they were conducted in the same setting. Its practical focus spans dispatch, on-scene assessment, transport, cultural communication and workforce preparation. The source publications and DOI links are included for traceability.

Important limitations remain. Only a small number of the identified primary publications examine Hajj EMS operations directly; one Hajj paper addresses health communication rather than ambulance clinical outcomes. Several studies are qualitative or cross-sectional, and the translation app was tested in a small, nonrandomized pilot. Publication periods, outcome measures and healthcare systems vary. Moreover, a complete historical search and screening audit trail was not

supplied, so the narrative evidence map cannot be represented as a formally completed, exhaustive systematic review.

Potential language-discordance misclassification is relevant to routine EMS datasets: the absence of a recorded language-barrier flag does not demonstrate that communication was adequate. Future investigations should separately record preferred language, interpreter modality, communication failures, patient severity and outcome timing to limit confounding. Generalization across gathering seasons also requires attention to changing attendance, multilingual service capacity and traffic arrangements.

4.5 Future Research Priorities

Prospective Saudi multicentre studies across Hajj seasons should link dispatch audio or structured call data, ambulance clinical records and hospital outcomes. Such work could compare similar patients with and without documented communication difficulties while adjusting for acuity, location, transport access and operational congestion. Feasible outcomes include interpreter-connection latency, dispatch accuracy, time to critical treatment, patient-reported understanding, refusal after informed explanation, repeat emergency contact and important adverse events.

Clustered or stepped-wedge evaluations may be appropriate when implementing multilingual dispatch tools or communication training across EMS stations, provided service-wide changes and seasonal effects are accounted for. Mixed-methods research could clarify whether standardized translated phrases are intelligible, culturally acceptable and clinically useful in noisy high-density environments. Patient and pilgrim perspectives should be included alongside EMS personnel; this is particularly important to avoid designing a service solely around clinician perceptions.

Research should also examine continuity of communication from first call to receiving hospital. A well-functioning initial interpreter connection may offer little benefit if patient language needs disappear from subsequent handovers. Standardized documentation of preferred language and validated interpretation methods would make these transitions easier to study and improve.

5. Conclusion

Language and cultural barriers are important and potentially modifiable challenges in prehospital emergency care during international mass gatherings. Evidence from Hajj responders identifies multilingual communication, missing histories, cultural sensitivity and operational coordination as recurring concerns. Outside the mass-gathering setting, observational studies demonstrate delays in critical dispatch processes, while early evidence indicates possible benefits from structured dispatch systems, translation tools and clinician education.

For the Saudi Red Crescent Authority and other organizations planning international events, the strongest immediate implication is to treat communication access as part of emergency-system preparedness. Multilingual dispatch pathways, reliable interpretation, respectful patient-centered assessment and coordinated handover procedures warrant implementation planning and formal evaluation. The effect of these strategies on Hajj-specific clinical outcomes remains an important subject for prospective research.

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Appendix A. PRISMA 2020 Selection Documentation

The source files supplied for this manuscript contained the research title and author list, not an executed-search audit trail. The following fields are reserved for insertion of record-level evidence. The 11 publications in Table 1 are a topic-relevant evidence map and should not be backfilled into a fictitious screening sequence.

Table A1. PRISMA documentation fields

PRISMA stage	Record status	Supporting documentation
Records identified by database	Not established	Database names, exact dates, search strings and exported identifiers required
Duplicates removed	Not established	Deduplication log and library export required
Records screened / excluded	Not established	Title/abstract screening decisions required
Full texts sought / unavailable	Not established	Retrieval list and reasons required
Full texts excluded	Not established	Citation-specific primary reasons for exclusion required
Studies formally included	Not established	Final eligible citation list matched to screening log required
Topic-relevant papers mapped here	11 verified publications	Four Hajj/pilgrimage studies; seven related EMS/dispatch studies; not a PRISMA included count

Appendix B. Reproducible Search Strategy Templates

The following strategies are proposed for a subsequent dated and documented search. They are not claims about historical database searches already performed. No publication range was imposed in the evidence map; final searches should specify and preserve any date and language limits.

B1. PubMed/MEDLINE

(("Emergency Medical Services"[MeSH] OR ambulance*[tiab] OR paramedic*[tiab] OR prehospital[tiab] OR "emergency dispatch"[tiab]) AND ("Communication Barriers"[MeSH] OR "language barrier*"[tiab] OR "language discordance"[tiab] OR interpreter*[tiab] OR "cultural competenc*"[tiab]) AND ("Mass Gatherings"[MeSH] OR "mass gathering*"[tiab] OR Hajj[tiab] OR pilgrimage*[tiab]))

Supplementary sensitivity search: remove the final mass-gathering group of terms to identify EMS-specific communication studies for indirect comparison. Report the two search yields separately.

B2. Scopus

TITLE-ABS-KEY((paramedic* OR ambulance* OR prehospital OR "emergency medical services" OR "emergency dispatch") AND ("language barrier*" OR "language discordance" OR interpreter* OR "cultural competenc*") AND ("mass gathering*" OR Hajj OR pilgrimage*))

B3. Web of Science

TS=((paramedic* OR ambulance* OR prehospital OR "emergency medical services") AND ("language barrier*" OR interpreter* OR "cultural competenc*") AND ("mass gathering*" OR Hajj OR pilgrimage*))

B4. CINAHL and Embase

Use equivalent indexed subject headings for Emergency Medical Services, Communication Barriers, Interpreters, Cultural Competence and Mass Gatherings, combined with title/abstract free text. Document thesaurus expansion, search interfaces, date limits and the export date separately for each database.

Appendix C. Data Extraction and Evidence Verification

Table C1. Fields needed for auditable study-level extraction

Field	What to record
Study identifier	First author, year, title, DOI, country, mass-gathering relevance
Design and selection	Qualitative, cohort, survey or intervention; sampling frame and participant count
Communication exposure	Language need, interpreter access, cultural context, comparator and definition
Outcomes	Patient-centered, dispatch, clinical-process, staff perception, timing and follow-up period
Measured result	Original numerator/denominator, effect estimate, uncertainty and measurement tool
Confounding and risk of bias	Relevant design-specific JBI criteria with evidence excerpt and page
Applicability	Direct Hajj evidence or indirect non-Hajj EMS evidence; contextual factors

Appendix D. JBI Critical Appraisal Audit Framework

Formal critical appraisal should be undertaken by at least two reviewers using the version of each JBI tool appropriate to the original study design. Each criterion requires an evidence-based Yes, No, Unclear or Not applicable response, with source page or section and a reconciliation record. An overall high/low-risk judgment should not be created merely from the number of positive checklist responses.

D1. Qualitative studies

Check congruity of research question, methodology and analysis; participant voice; researcher positioning; ethics; and traceability between results and direct evidence.

D2. Cross-sectional surveys

Check inclusion criteria, respondent selection, measurement validity, exposure/outcome definitions, confounding and appropriateness of analysis.

D3. Cohort and record-based investigations

Check comparability of language groups, exposure classification, missing data, follow-up and adjustment for acuity and socioeconomic or system-level factors.

D4. Nonrandomized intervention studies

Check baseline differences, temporality, concurrent service changes, control-group selection, objective versus perceived outcomes and uncertainty in small subgroups.