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Designing a Service Landscape for an Emergency Department Information System Based on Emergency Assessment Using Enterprise Architecture Planning

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Abstract

The complexity of emergency care requires information systems that can accommodate clinical activities and the information generated at each stage of patient management. Without a clear architectural structure, the relationship between service processes, clinical records, and system functions may be difficult to establish. This research proposes a Service Landscape blueprint for an Emergency Department (ED) nursing care information system through Enterprise Architecture Planning (EAP), supported by selected phases of the TOGAF Architecture Development Method (ADM). A qualitative descriptive approach was applied to structure the requirements of emergency care into business, data, and application architectures. The resulting design organizes five core services, ranging from primary survey assessment using the ABCD approach to patient disposition. Each service is mapped to relevant clinical data entities and application modules, providing a conceptual overview of how information is recorded and managed throughout the care process. Validation was conducted using 20 indicators across four architectural aspects, yielding an overall score of 4.06. Data Architecture received the highest score (4.23), whereas Service Landscape scored 3.90. The blueprint offers a structured foundation for subsequent system development. Nevertheless, implementation and operational evaluation are still required. The proposed architecture considers the utilization of relevant patient information from the existing Electronic Health Record (RME) within emergency care workflows; however, the technical design and implementation of automated data exchange with the existing RME are beyond the scope of this study.

Keywords: *Emergency Department; Emergency Assessment; Service Landscape; Enterprise Architecture Planning; Clinical Information Management*

Introduction

Digital transformation in healthcare requires information systems that support not only clinical data recording but also the structured management of healthcare services and information flows. In emergency departments (EDs), timely access to accurate clinical information is particularly important because patient conditions may require rapid assessment, prioritization, and treatment. Health information technology can support clinical information management and emergency department workflows, highlighting the importance of designing systems that reflect the information needs of emergency care (Kruse et al., 2025).

The quality and completeness of clinical documentation also influence communication among healthcare professionals and the continuity of patient care, particularly during transitions between healthcare services (Aghajafari et al., 2020).

Emergency assessment involves interrelated clinical activities, including triage, the primary survey using the ABCD approach (Airway, Breathing, Circulation, Disability, and Exposure), further patient assessment, and clinical documentation using the SOAP framework (Subjective, Objective, Assessment, and Plan). Each activity generates or uses clinical information to support subsequent assessment, treatment, and disposition decisions. Consequently, emergency care information systems require an architectural design that represents the relationships among clinical services, data entities, and application functions rather than treating each component as an isolated element (Lorenzetti et al., 2018).

Enterprise Architecture (EA) provides a structured approach to aligning business processes, information requirements, data structures, and application components within an organizational blueprint. In healthcare, EA has been explored as a means of supporting digital transformation and improving alignment between organizational needs and information technology. The Open Group Architecture Framework (TOGAF) provides a systematic method for developing architecture artifacts, including business and information systems architectures, that can guide the planning of information systems according to defined organizational

requirements (Mohd Rahimi et al., 2023). Although enterprise architecture has been discussed in healthcare information systems research, the architectural relationships among emergency nursing services, clinical information requirements, and supporting application functions require a context-specific representation. In emergency departments, these elements need to be organized in a way that reflects the sequence of care activities and the information required at each stage. This study addresses this design need by developing a Service Landscape blueprint that connects emergency nursing services with their corresponding data entities and application modules. The focus is on establishing architectural traceability across these elements rather than evaluating the clinical effectiveness of an implemented information system.

The contribution of this study is a context-specific Service Landscape blueprint for an Emergency Department nursing care information system. The blueprint links five core services, Primary Survey Assessment, Triage Service, Emergency Patient Assessment, Clinical Documentation Service, and Patient Disposition Service with the clinical data entities and application modules required to support them. By making these relationships explicit, the proposed design provides an architectural reference for subsequent system development and requirement refinement. Accordingly, this study aims to design and assess a Service Landscape blueprint for an Emergency Department nursing care information system using an Enterprise Architecture Planning approach guided by selected TOGAF ADM phases.

Research Method

This study employed a qualitative descriptive approach to design a Service Landscape for an Emergency Department (ED) nursing care information system. The research focused on analyzing emergency care activities and translating the identified requirements into a structured enterprise architecture. The design process emphasized the relationships among business services, clinical data, and application functions to establish an architectural blueprint for the proposed information system.

The research was conducted through several sequential stages, beginning with data collection and requirements analysis, followed by architecture design and blueprint validation. The overall research procedure is presented in Figure 1.

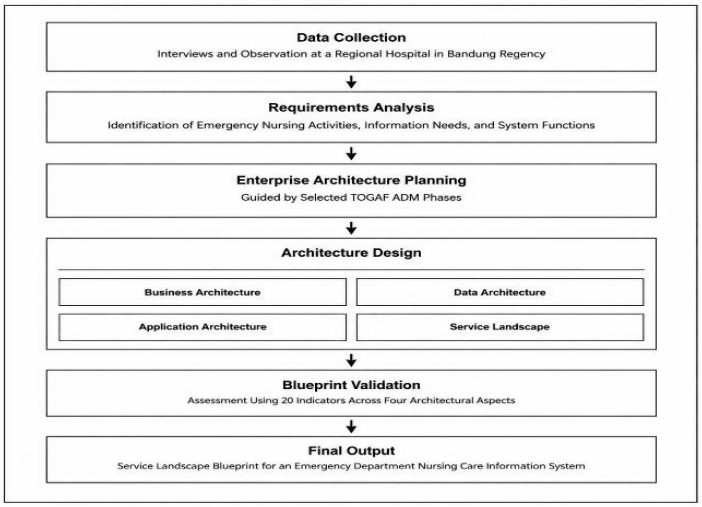


Figure 1 Research Methodology

Data Collection and Requirements Analysis

This study employed a qualitative descriptive approach to identify and structure the requirements for an Emergency Department nursing care information system. Data were collected at a regional hospital in Bandung Regency, Indonesia, through interviews and observation. Interviews were used to obtain information about emergency nursing care activities, the information required to support these activities, and the operational needs relevant to the proposed information system. Observation was conducted to examine the emergency care workflow and the sequence of activities performed in the study setting. The information obtained from these methods was used as the basis for identifying the services, data requirements, and application functions represented in the proposed architecture.

The requirements analysis focused on identifying the main activities involved in emergency care and determining the information required to support each activity. Emergency Assessment was used as the primary

reference for organizing the clinical processes, including the ABCD-based primary survey, triage, further patient assessment, clinical documentation, and patient disposition.

The identified requirements were organized into business, data, and application requirements. Business requirements were used to determine the services that needed to be supported by the system. Data requirements were derived from the information generated and processed throughout the emergency care workflow. Application requirements were then identified by mapping the required services and data to the proposed functional modules.

Enterprise Architecture Planning

The architecture was developed using an Enterprise Architecture Planning (EAP) approach, guided by the relevant phases of The Open Group Architecture Framework (TOGAF) Architecture Development Method (ADM). The architectural work focused on Business Architecture, Data Architecture, and Application Architecture to establish traceability between emergency care activities, clinical information, and system functions.

Enterprise Architecture Planning (EAP) was adopted as the overarching planning approach to identify organizational requirements and structure the proposed enterprise architecture. Meanwhile, selected phases of the TOGAF Architecture Development Method (ADM) were used to guide the development and organization of the architectural artifacts. Rather than being applied as two separate methodologies, EAP and TOGAF ADM were aligned through a requirements-driven process in which each approach served a complementary purpose.

The alignment was carried out by relating the research activities to the relevant TOGAF ADM phases. The Preliminary Phase and Phase A (Architecture Vision) supported the establishment of the research scope, stakeholder needs, and architectural objectives. Phase B (Business Architecture) was used to structure the emergency department services and identify their relationships. Subsequently, Phase C (Information Systems Architectures) guided the development of Data Architecture and

Application Architecture. Data Architecture identified the clinical information entities required by each service, while Application Architecture translated these requirements into supporting application functions.

The resulting architectural artifacts were then consolidated into the Service Landscape blueprint to establish traceability among business services, clinical data entities, and application modules. Through this alignment, EAP provided the planning foundation, while TOGAF ADM provided a structured framework for organizing the architecture development activities. This approach helped maintain consistency across the architectural domains and minimize overlapping activities.

Business Architecture was developed by identifying the primary services and describing their relationships within the emergency care process. Data Architecture was subsequently developed to identify the clinical information entities required to support these services. Application Architecture was then designed by mapping the identified services and data entities to the functional modules of the proposed information system.

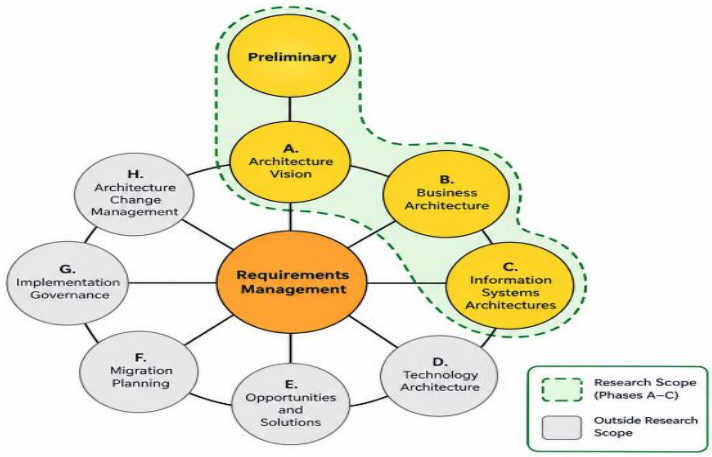


Figure 2 Research Methodology Using the Selected TOGAF ADM Phases

The research methodology illustrates the sequence of architectural activities, beginning with requirements identification and continuing through the development of Business Architecture, Data Architecture, and

Application Architecture. These activities provide the basis for constructing the proposed Service Landscape.

Service Landscape Development

The Service Landscape was developed by bringing together the results of the three architectural areas. The business services represent the main functions of emergency care, while the data entities represent the clinical information required to support those functions. The application modules define the system functions responsible for managing and presenting the required information.

The proposed architecture includes functional areas for Master Data, Emergency Assessment, Clinical Documentation, Dashboard, Reporting, and Audit Log. Emergency Assessment supports the clinical assessment workflow, while Clinical Documentation supports the recording of nursing care information. Dashboard and Reporting provide access to operational information, and Audit Log supports the recording of relevant system activities.

The proposed architecture considers the utilization of relevant patient information available in the existing Record Medical Electronic (RME/RME) to support emergency care workflows. Within the scope of this study, the relationship between the proposed architecture and the existing RME is addressed at the conceptual level, without specifying the technical mechanisms for automated data exchange. The architectural design therefore emphasizes the identification of business services, data requirements, and application functions that support emergency assessment and clinical documentation. Detailed interoperability mechanisms are reserved for subsequent architectural development.

Research Output

The main output of this study is a Service Landscape blueprint that describes the relationships among business services, clinical data entities, and application modules in an ED nursing care information system. The blueprint is intended to provide an architectural reference for subsequent system development. The assessment of architectural maturity using the Architecture Capability Maturity Model (ACMM) will be presented

separately in the Results and Discussion section based on the actual evaluation data.

Results and Discussion

Requirement analysis and architecture vision were established as the initial steps in designing the Emergency Department (ED) nursing care information system. This stage aimed to identify the main service requirements, information needs, and application functions required to support emergency nursing care. The analysis was used as the foundation for developing Business Architecture, Data Architecture, and Application Architecture within the Service Landscape.

The architectural scope focuses on emergency care activities, beginning with the initial patient assessment and triage process, followed by further assessment, nursing documentation, and patient disposition. Emergency Assessment is used as a clinical reference for organizing assessment-related information, particularly the ABCD components of the primary survey. The proposed architecture is intended to establish traceability between the services performed, the information generated, and the application functions required to support those services.

Table 1 Requirement Analysis

Requirement Category	Identified Requirement
Business Requirement	Organize the main emergency department services into a structured service architecture.
Information Requirement	Provide structured information for primary survey, triage, further patient assessment, clinical documentation, and patient disposition.
Data Requirement	Identify and organize the data required to support each emergency department service.
Application Requirement	Define application modules that support the identified business services and their associated information requirements.

Table 1 summarizes the architectural requirements that guide the design of the ED nursing care information system. Business requirements establish the service scope, while information and data requirements

determine the information that must be recorded and managed. Application requirements subsequently translate these needs into functional modules. This relationship provides a basis for maintaining consistency between the operational requirements of emergency care and the proposed information system design.

Table 2 Business Goals

No.	Business Goal	Description
1	Structured Emergency Assessment	Organize primary survey, triage, and further patient assessment within a clear service structure.
2	Systematic Clinical Documentation	Support the structured recording and management of nursing care information.
3	Organized Patient Information	Establish a consistent structure for storing and retrieving information generated during ED services.
4	Traceable Service Architecture	Establish relationships between business services, data requirements, and application modules.

The business goals in Table 2 provide the direction for developing the architecture. Rather than focusing solely on digitizing individual forms, the proposed design emphasizes the relationships between emergency care services and the information required to support them. These goals guide the subsequent development of the business process model, data structures, application modules, and integrated Service Landscape.

Business Architecture

Business Architecture describes the principal services and processes that form the operational foundation of the ED nursing care information system. In this study, the architecture was developed by examining the existing business process and formulating a proposed process that incorporates structured information management.

Existing Business Process (AS-IS)

The existing business process (AS-IS) represents the current workflow of emergency department services, as documented in the existing process diagram. The workflow provides the baseline for understanding how

emergency care activities are performed and how information is generated throughout the service process.

The AS-IS process is used to identify the relationship between patient assessment activities, clinical decision-making, nursing documentation, and patient disposition. Its analysis provides the basis for determining which activities require structured information support in the proposed architecture. The existing workflow therefore serves as a reference for defining the future process without assuming that the proposed information system has already been implemented.

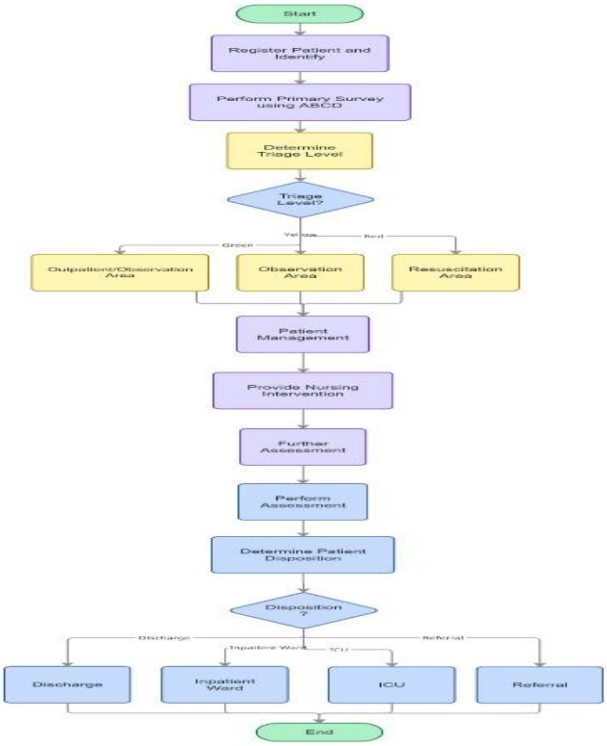


Figure 3 Existing Business Process (AS-IS)

Proposed Business Process (TO-BE)

The proposed business process (TO-BE) describes how the identified ED services are intended to be supported by the proposed information system. In contrast to the AS-IS diagram, the future process is presented in a table to explain the relationship between each business process and its corresponding system support.

Table 3 Proposed Business Process (TO-BE)

No.	Business Process	Proposed Process	Supporting Application Module
1	Primary Survey	Record initial patient assessment findings based on the ABCD approach.	Emergency Assessment
2	Triage	Record triage information to support the classification and prioritization of patients.	Emergency Assessment
3	Emergency Patient Assessment	Record further assessment findings as part of the emergency care process.	Emergency Assessment
4	Clinical Documentation	Record and manage nursing care documentation in a structured format.	Clinical Documentation
5	Patient Disposition	Record the patient's disposition and associated information at the end of the ED care process.	Patient Disposition support through the proposed application functions

Table 3 illustrates how the proposed information system is intended to support the main emergency care processes through structured information recording. The Primary Survey and Triage processes are positioned within the Emergency Assessment module, while further assessment activities are supported by the same module. Clinical Documentation provides dedicated support for nursing documentation, and patient disposition is represented as a distinct business service requiring appropriate information management.

The proposed process emphasizes the organization of information generated during emergency care. The architecture does not assume that all clinical decisions are automated; instead, it defines how relevant assessment and service information can be recorded and managed through the proposed application. The proposed process also considers the utilization of relevant patient information available in the existing RME.

However, automated data exchange between the proposed application and the existing RME is not specified within the scope of this study.

Business Service Landscape

The Business Service Landscape was developed by identifying the main services that represent the core activities of the ED nursing care information system. The services provide a conceptual structure for organizing emergency care activities and establishing the basis for subsequent data and application modeling.

The proposed Business Service Landscape consists of five main services: Primary Survey Assessment, Triage Service, Emergency Patient Assessment, Clinical Documentation Service, and Patient Disposition Service. Digital tools have been investigated as a means of supporting patient check-in and triage in emergency departments. However, evidence regarding their effects on operational efficiency and triage accuracy remains mixed, indicating that digital support should be designed around the clinical workflow rather than assumed to improve outcomes automatically (Lammila-Escalera et al., 2025). These services represent distinct but related functions within the emergency care process. Emergency care involves transitions between clinical activities and healthcare professionals, making the accuracy and consistency of information transfer important. Research on emergency handover assessment also highlights the need for appropriate methods to evaluate the quality of information exchange and continuity of patient care (Ullman et al., 2021).

Primary Survey Assessment supports the recording of initial patient assessment findings based on the ABCD approach. Triage Service organizes the recording of triage information, while Emergency Patient Assessment supports the documentation of further assessment findings. Clinical Documentation Service manages nursing care records, and Patient Disposition Service supports the recording of the patient's disposition and related information.

These services are treated as business-level functions rather than individual user roles or technical components. Their identification enables

the architecture to connect the clinical activities of emergency care with the information structures and application modules required to support them.

The resulting service structure becomes the basis for Data Architecture and Application Architecture. Each service requires specific information, while some data may be used by more than one service.

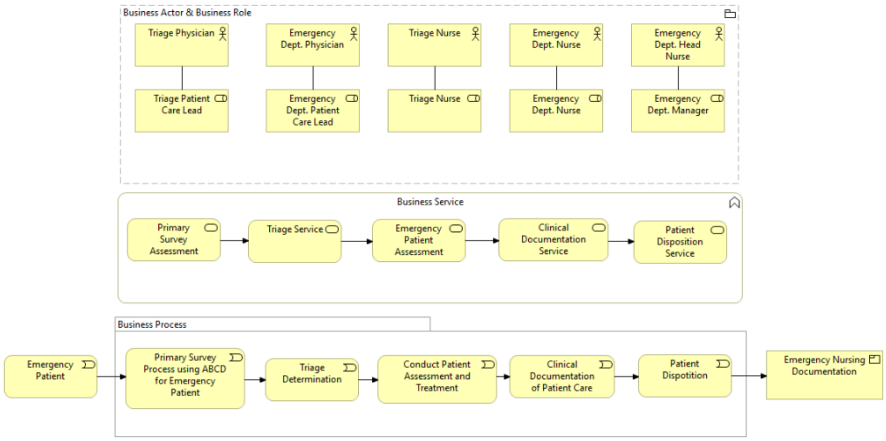


Figure 4 Business Service

The resulting service structure becomes the basis for Data Architecture and Application Architecture. Each service requires specific information, while some data may be used by more than one service. Mapping these relationships helps establish consistency between the clinical workflow and the proposed information system.

Data Architecture

Data Architecture identifies the information required to support the business services defined in the Business Architecture stage. In this study, the data requirements are derived from the activities associated with primary survey, triage, further patient assessment, clinical documentation, and patient disposition.

Identification of Data Requirements

The identification of data requirements focuses on determining the information that must be recorded and managed by each business service. The data structure is intended to support consistent documentation and information retrieval throughout the ED care process.

Table 4 Identification of Data Requirements

Business Service	Main Data Requirement	Purpose
Primary Survey Assessment	Patient identification and ABCD-based primary survey findings	To record the findings of the initial patient assessment.
Triage Service	Triage assessment information and patient priority classification	To document the information used in patient prioritization.
Emergency Patient Assessment	Further assessment findings and relevant clinical information	To maintain records of subsequent patient assessments.
Clinical Documentation Service	Nursing care records and related documentation	To organize the documentation generated during nursing care.
Patient Disposition Service	Disposition information and relevant supporting records	To document the patient's disposition following ED care.

Table 4 links the identified business services to their information requirements. The primary survey data are organized around the ABCD assessment approach, while triage data support the documentation of patient prioritization. Triage requires the structured assessment and classification of patient urgency. Recent research has explored computational approaches to improve triage performance, although these approaches should not be assumed to be part of the proposed system unless they are explicitly included in its design (Porto, 2024) . Further assessment data provide additional clinical information, and nursing documentation records the care-related information generated during the service process. Disposition data complete the information structure by recording the patient's subsequent status or destination. This data mapping provides a conceptual basis for developing the system's data entities and relationships. The data architecture presents a conceptual representation of the

information entities required to support the identified ED services. Detailed database specifications are beyond the scope of this architectural design.

Data Architecture Diagram

The Data Architecture Diagram illustrates the relationship between patient-related information, clinical records, and the Emergency Department Information System. The diagram identifies six main information components: Patient, Patient Triage, Patient Primary Survey, Patient Assessment, Patient Clinical Documentation, and Patient Disposition. Each component is associated with a corresponding data record, including Patient Data, Triage Record, Primary Survey Record, Assessment Record, Clinical Documentation Record, and Disposition Record.

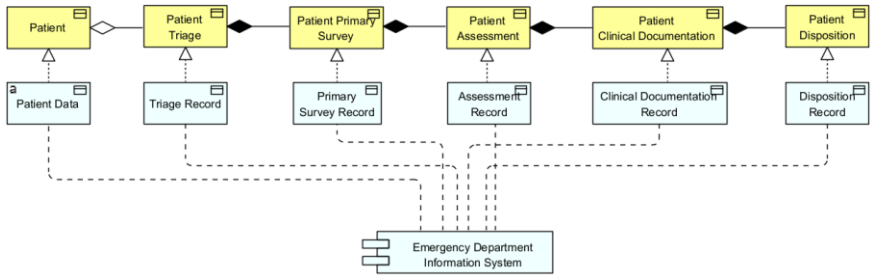


Figure 5 Data Architecture Diagram

The diagram represents how information generated throughout the emergency care process is organized into distinct records associated with the Emergency Department Information System. Patient Data represents the patient's information, while the remaining records correspond to specific stages of emergency care, from triage and primary survey to further assessment, clinical documentation, and patient disposition. This structure provides a conceptual basis for organizing clinical information according to the services supported by the proposed system. Information exchange during emergency care transitions can be affected by information loss, inconsistent documentation, and the lack of standardized communication practices. These challenges reinforce the importance of defining clear information structures for the clinical records associated with emergency care services (Troyer & Brady, 2020).

By associating each service-related component with its corresponding record, the architecture establishes a clear mapping between emergency care activities and their information requirements. This mapping supports the subsequent development of the application architecture by identifying the information components that need to be managed by the system.

Data Dissemination

The Data Dissemination Diagram illustrates how information generated throughout emergency nursing care is composed into a structured data model. The process involves patient data, primary survey records, triage records, assessment records, clinical documentation records, and disposition records.

These information components contribute to the Emergency Nursing Care Data Model, which forms the basis for the Data Dissemination Scheme. The scheme represents the intended distribution and use of information by nursing staff, IGD management, and the Electronic Health Record (RME). Interoperability requires information systems to represent and exchange data in a consistent manner. Nevertheless, the proposed data dissemination scheme describes the intended use and distribution of information; it does not establish that automated exchange with the existing RME has been implemented (Torab-Miandoab et al., 2023).

The diagram also positions ABCD as part of Emergency Assessment rather than as a separate data object. This structure supports the organization of clinical information and provides a basis for aligning data requirements with the application architecture.

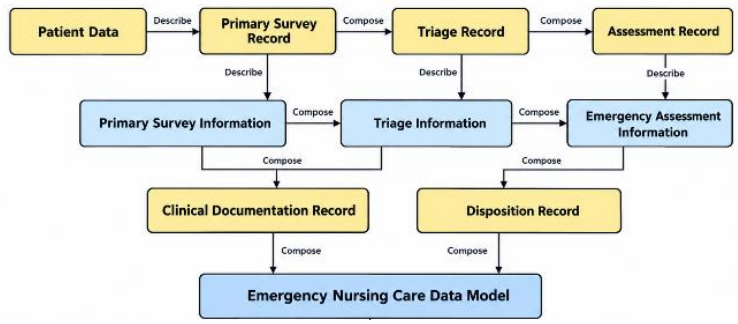


Figure 6 Data Dissemination Diagram

Application Architecture

Application Architecture translates the business services and data requirements into functional modules within the proposed ED nursing care information system. The purpose of this stage is to define how application functions support the services identified in Business Architecture and manage the corresponding information requirements.

Identification of Application Modules

The proposed application structure includes modules that directly support emergency care services and supporting functions that facilitate information management.

Table 5 Proposed Application Modules

No.	Application Module	Main Function
1	Master Data	Manage reference data required by the application, according to the defined system scope.
2	Emergency Assessment	Support the recording and management of primary survey, triage, and further patient assessment information.
3	Clinical Documentation	Support the recording and management of nursing care documentation.
4	Patient Disposition	Support the recording and management of patient disposition information.
5	Dashboard	Present a summary of information available within the system according to the defined reporting requirements.
6	Reporting	Support the presentation or generation of reports based on recorded information.
7	Audit Log	Record relevant system activities to support traceability.

The application modules are organized according to their functional responsibilities. Emergency Assessment supports the assessment-related services, while Clinical Documentation provides a dedicated function for nursing records. Clinical documentation is an important component of emergency department workflow because it involves recording and maintaining information generated during patient care. Evidence concerning documentation support in emergency departments provides a

relevant context for considering documentation as a distinct functional component of the proposed application architecture (Ullman et al., 2021) . Patient Disposition supports the management of disposition information. Master Data, Dashboard, Reporting, and Audit Log provide supporting functions according to the scope of the proposed application.

This modular structure helps establish a clear relationship between application functions and business requirements. It also provides a basis for tracing each service to the data it requires and the module responsible for supporting it. The architecture remains a design blueprint and should not be interpreted as evidence that every proposed module has already been implemented.

Application Architecture Diagram

The Application Architecture Diagram illustrates the proposed application structure and the relationships between modules supporting emergency department services.

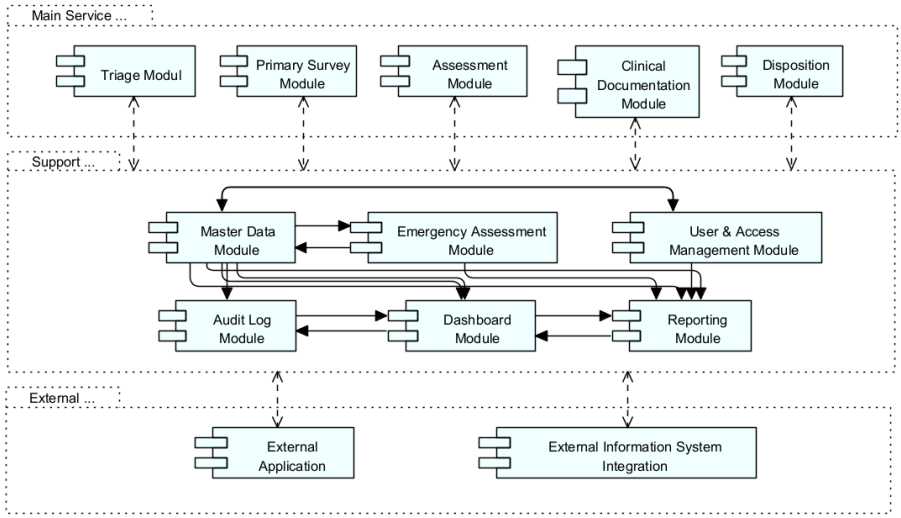


Figure 7 Application Architecture Diagram

The application structure links the core service functions with supporting modules for information management and reporting. Emergency Assessment supports assessment-related activities, while Clinical Documentation and Patient Disposition manage nursing records and disposition information. The resulting architecture provides a

reference for aligning application functions with the identified business and data requirements. The design of a health information system requires consideration of the relationships between organizational needs, information management, and application functions. Mapping these elements provides a structured basis for defining system capabilities and maintaining consistency between service requirements and application design (Epizitone et al., 2023).

Relationship Between Services and Application Modules

The relationship between business services and application modules is established by mapping each service to the functions that support its activities. Primary Survey Assessment, Triage Service, and Emergency Patient Assessment are supported by Emergency Assessment. Clinical Documentation Service is supported by the Clinical Documentation module, while Patient Disposition Service is supported by the corresponding disposition-related application functions.

Supporting modules may provide shared capabilities across the system. For example, Master Data can provide reference information to relevant modules, while Dashboard and Reporting can present information that has been recorded and made available within the system. The specific data access and module relationships should follow the final application design.

The mapping establishes traceability from the identified business services to the proposed application functions. This traceability is important because it allows the architectural design to be reviewed against the operational requirements identified at the beginning of the study.

Service Landscape Blueprint

The Service Landscape Blueprint brings together Business Architecture, Data Architecture, and Application Architecture into a single conceptual representation. It illustrates how the main ED services are supported by the information they require and the application modules designed to manage that information.

In the proposed architecture, the five business services form the service layer: Primary Survey Assessment, Triage Service, Emergency Patient Assessment, Clinical Documentation Service, and Patient Disposition

Service. Each service is associated with relevant data requirements and supporting application functions. The Emergency Assessment module supports the assessment-related services, while Clinical Documentation and Patient Disposition provide support for nursing documentation and disposition-related activities.

The relationship between services, data, and applications provides architectural traceability. Business services define the operational functions to be supported; data requirements specify the information needed to perform those functions; and application modules provide the proposed functional support for recording, managing, and retrieving the information.

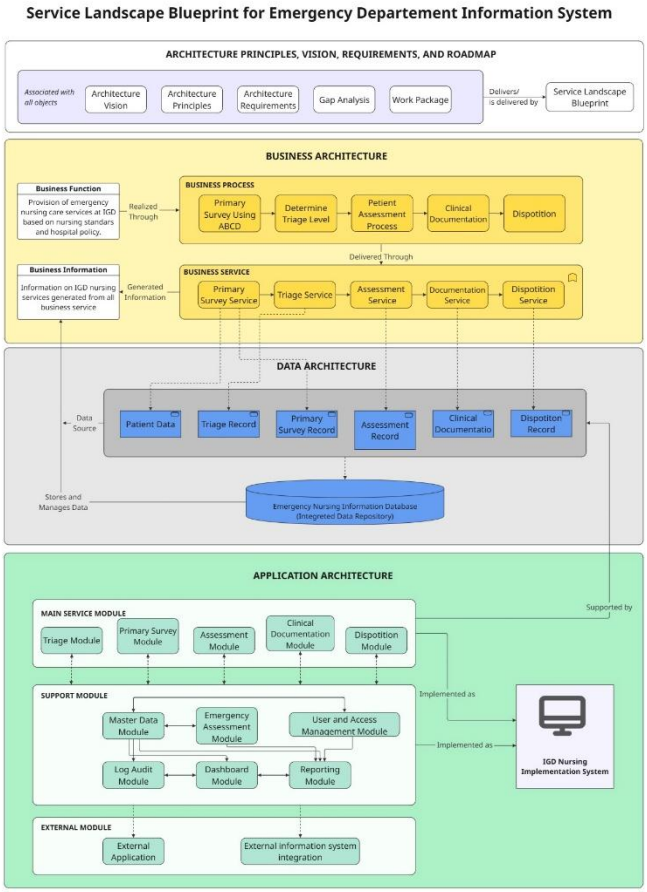


Figure 8 Service Landscape Blueprint for the ED Nursing Care Information System

The proposed Service Landscape is intended to serve as an architectural reference for the development of an ED nursing care information system. It provides a structured representation of the relationship between emergency care services and their supporting information system functions. The proposed blueprint considers the utilization of relevant patient information from the existing RME within emergency care workflows. However, the technical mechanisms for automated data exchange and interoperability with the existing RME are not specified in this study and require further architectural development. The proposed blueprint considers the utilization of relevant patient information from the existing RME within emergency care workflows. However, the technical mechanisms for automated data exchange and interoperability with the existing RME are not specified in this study and require further architectural development.

Architecture Validation

Architecture validation is intended to assess the suitability of the proposed Service Landscape against the requirements of ED nursing care services. Architecture validation was conducted to assess the suitability of the proposed Service Landscape against the requirements of ED nursing care services. The assessment results were interpreted using the TOGAF Architecture Capability Maturity Model (ACMM) classification to describe the maturity level of the proposed architectural blueprint. The proposed architecture was assessed using an evaluation instrument comprising 20 indicators distributed across four aspects: Business Architecture, Data Architecture, Application Architecture, and Service Landscape, with five indicators assigned to each aspect. The validation involved four evaluators representing the key business actors identified in the Business Architecture. Each evaluator assessed the proposed architectural blueprint from the perspective of their respective roles within the emergency department service processes. To maintain confidentiality, individual evaluator identities and specific role assignments are not disclosed in this study. Their assessments were used to evaluate the alignment of the proposed architecture with the identified business services, clinical information

requirements, and supporting application functions. The assessment focused on the suitability of the proposed services, the organization of clinical data, the relevance of application modules, and the consistency of relationships across the architectural layers. The scores for each aspect were calculated from the corresponding assessment results, and the overall score was obtained by aggregating the four aspect scores.

Calculation of Validation Values

The validation scores were calculated by averaging the ratings provided by the four evaluators for each indicator. The overall average was subsequently calculated from the average scores of all 20 indicators. The resulting value was then mapped to the TOGAF ACMM classification to determine the maturity level of the proposed architectural blueprint.

Table 6 Validation Value Calculation Formula

Calculation	Formula	Remarks
Average indicators	$\bar{X}_i = \frac{\sum_{j=1}^{n} X_{ij}}{n}$	X_{ij}= Scores of 4 validators on the 1st indicator; Calculate the average of each indicator.i
Overall average	$\bar{X} = \frac{\sum_{i=1}^{m} \bar{X}_i}{m}$	$\bar{X}_i$= Average of the to-; Calculate the average of all indicators (20 indicators).i

The average values obtained are then mapped into the TOGAF Architecture Capability Maturity Model (ACMM) classification to determine the maturity level of the architectural blueprint.

TOGAF Maturity Level Classification

The average values obtained were mapped to the TOGAF Architecture Capability Maturity Model (ACMM) classification to determine the maturity level of the architectural blueprint, as presented in Table 7. The classification is used to determine the level of blueprint maturity based on the average value obtained from the validation results.

Table 7 TOGAF Maturity Level Classification

Average Score	Level Maturity	Description
0,00 – 0,99	Level 0 – None	Blueprints do not yet meet the basic principles of Enterprise Architecture.

1,00 – 1,99	Level 1 – Initial	Blueprints are still in their early stages and require a lot of refinement.
2,00 – 2,99	Level 2 – Under Development	Blueprints have been formed but are not yet fully integrated.
3,00 – 3,99	Level 3 – Defined	The blueprint has been well documented and in accordance with architectural needs.
4,00 – 4,99	Level 4 – Managed	Blueprint has been integrated and deserves to be used as a reference for system development.
5,00	Level 5 – Optimized	Blueprint has fulfilled all architectural principles optimally.

The validation results represent the assessments of four evaluators representing the key business actors involved in emergency department services.

Table 8 Recapitulation of ED Service Landscape Blueprint Validation Results

Architectural Aspects	Assessment Focus	Number of Indicators	Total Score
Business Architecture	Suitability of ED services and business goals.	5	4.01
Data Architecture	Data structures, entity relationships, and ABCD assessment data.	5	4.23
Application Architecture	Module suitability, relationships, and implementation readiness.	5	4.11
Service Landscape	Consistency and traceability across architectural layers.	5	3.90
	Total	**20**	**4.06**

The assessment produced an overall average score of 4.06 across the four architectural aspects. Data Architecture received the highest score (4.23), followed by Application Architecture (4.11) and Business Architecture (4.01), while Service Landscape received 3.90. These results indicate that, within the assessment instrument used, Data Architecture received the strongest evaluation, whereas the consistency and traceability of the overall Service Landscape represent an area for further refinement. The scores should be interpreted in relation to the stated indicators and

assessment procedure rather than as evidence of the operational effectiveness of an implemented system.

Recapitulation of Service Landscape Validation Results

The validation results show an overall score of 4.06 across 20 indicators covering Business Architecture, Data Architecture, Application Architecture, and Service Landscape. Data Architecture achieved the highest score of 4.23, followed by Application Architecture at 4.11 and Business Architecture at 4.01. Meanwhile, Service Landscape obtained a score of 3.90. These results indicate that the proposed blueprint received positive assessments across the four architectural aspects, while the Service Landscape aspect provides an opportunity for further improvement.

Meanwhile, Service Landscape obtained a score of 3.90. These results indicate that the proposed blueprint received positive assessments across the four architectural aspects, while the Service Landscape aspect provides an opportunity for further improvement.

Conclusion

This study developed a Service Landscape blueprint for an Emergency Department nursing care information system using an Enterprise Architecture Planning approach guided by selected TOGAF ADM phases. The blueprint connects five core emergency nursing services with their associated clinical information requirements and proposed application modules. The assessment produced an overall score of 4.06 across 20 indicators covering Business Architecture, Data Architecture, Application Architecture, and Service Landscape. Data Architecture received the highest score (4.23), while Service Landscape received the lowest score (3.90), indicating an area that may benefit from further refinement in terms of architectural consistency and traceability.

The proposed blueprint provides a structured reference for subsequent system development and requirement refinement. However, the findings reflect the design and assessment of an architectural blueprint rather than the operational performance of an implemented system. Further work is needed to refine the architecture, implement and test the proposed system,

and evaluate its suitability in operational emergency department settings. The proposed architecture considers the use of relevant patient information from the existing RME/RME; however, the technical design and implementation of automated data exchange remain beyond the scope of this study.

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Conflicts Of Interest

The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

Use Of Artificial Intelligence (AI)

The authors transparently disclose the use of AI Tool exclusively for the purpose of linguistic editing and grammatical refinement of the original draft. The authors maintain full responsibility for the manuscript's substantive content, data integrity, andfinal scientific conclusions.sion to publish the results.

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