Engineering and Technology Journal e-ISSN: 2456-3358

Volume 10 Issue 08 August-2025, Page No.-6635-6643

DOI: 10.47191/etj/v10i08.55, I.F. – 8.482

Developing Minimum Data Sets for Indonesian Electronic Health Record System

Teddie Darmizal[1], Lola Oktavia[2*]

[1,2]Departemen of Informatics Engineering, Faculty of Science and Technology, UIN Sultan Syarif Kasim Riau, Indonesia

ABSTRACT: This study aimed to develop a minimum data set (MDS) for electronic health record system in Indonesia. The content of the MDS in this study is different from the MDS from the results of the study in other developed countries. The technical preparation of MDS in this study follows the process of medical services provided to a patient from the beginning of admission to the completion of receiving services at the hospital. The initial stage of this research began by identifying data elements through literature reviews sourced from medical record documents of general hospitals and psychiatric hospitals in Indonesia, papers regarding minimum data set in other advanced countries, websites, and clinical guidelines. The Delphi technique was employed to validate the identified data elements through a survey of medical experts. A questionnaire was designed to determine data elements in both administrative and clinical departments. There were 5 and 21 data classes agreed upon by experts in the administrative and clinical sections with 28 and 870 data elements, respectively. This MDS could be a reliable tool for data standardization in electronic health record systems that can improve the quality of data and medical services in hospitals. Our data set can be used by the Indonesian health ministry, hospital information system development unit, and health surveillance centres for more efficient management of health data.

KEYWORDS: Minimum Data Set, Electronic Health Record, Electronic Health Record Systems, Data Class, Data Element

INTRODUCTION

The Minimum Data Set (MDS) is a set of data elements organized in a standardized way to facilitate their use in clinical and research contexts. It defines the specific data elements to be recorded, their storage methods, and the relationships and constraints among them [1]. The purpose of Minimum Data Set, as core health data elements, is to standardize data items and their definitions [2]. A Common Data Element consists of a clearly defined question (variable) along with a specified range of responses that is shared across multiple data sets or utilized in various studies [3].

MDS is a front line in developing and implementing an information management system with the potential to improve health information and, thus service quality [4]. The Minimum Data Set (MDS) is a tool for standardizing essential data within a specific area, enhancing information quality by defining necessary data elements consistently. As a result, MDS can ensure data quality and facilitate comparisons at both national and international levels by standardizing these elements [5].

By providing clear definitions of data elements, MDS aims to establish a shared language among all parties involved in registry and documentation. It also ensures the effective collection, analysis, reporting, and selection of critical data [6]. Additionally, MDS enhances medical history records, promotes data comparability, aids in the creation of a data repository, facilitates electronic data exchange across different healthcare systems, and ultimately improves data quality [7]. Based on their nature and use, disease data elements can be classified into administrative and clinical data. Administrative data typically encompass demographic and socioeconomic information, as well as address, phone number, patient referral details, and the primary profession of healthcare providers [5]. In contrast, clinical data vary based on the disease type. Typically, they encompass diagnosis, medical history, laboratory results, medical imaging findings, treatment interventions, disease progression, and outcomes [8].

In the healthcare system, data sets specify the data elements to be collected for each patient and offer standardized definitions for each element. Data comparison serves various purposes, including external accreditation, internal performance evaluation, and research and statistical analysis. Consequently, establishing standard data models and minimum data sets is crucial for managing the clinical performance of health organizations in every country [9][10][11][12]. In addition to using the experiences of developed countries, considering national standards, needs, and opinions of domestic experts is essential in the development of MDS [13].

In recent years, significant research has focused on the MDS for advancing electronic health systems (EHRS). Most of these studies concentrate on developing MDS models tailored to specific diseases, injuries, or patient groups [14].

MDS for holistic health recording that combines general and specialist MDS is not widely available in the literature. Indonesia does not have a minimum data set standard to support the development of electronic health records systems in central and regional government hospitals. Thus, this study aims to develop holistic MDS for the electronic health record system in Indonesia.

METHOD

This descriptive cross-sectional study was conducted in 2024. The **initial stage** of this research began by studying the medical services process and identifying data elements through literature reviews sourced from **medical record documents of general hospitals and psychiatric hospitals in Riau Province of Indonesia, papers regarding minimum data sets (MDS) in other advanced countries, websites, and clinical guidelines** (Table 1). A comprehensive review of recovered resources was carried out until saturation.

Table 1. Search Strategy for Retrieving Data Elements for Electronic Health Record System (EHRS)

Sites, Criteria, Strategy	Description
Website	World health organization
Search Engine	Google, Google Scholar
Database	Scopus, PubMed, Web of Science (Up to 30 Sep 2024)
Inclusion Criteria	Literature in the English language; scientific papers; annual reports; guidelines; books.
Exclusion Criteria	Non-peer-reviewed, reports and forms retrieved from personal blogs and abstracts with no accessible full text.
Keyword	"Electronic Health Record", "Hospital information system" AND "Data element", "Hospital Information system" AND "Minimum data set", "Health information system" AND "Minimum data set", "Hospital information database"

In the second stage, the data elements were classified as the leading group, data classes, subclasses, and data elements. Different from the data element content in preliminary research [1]-[11], the categorization of data elements in this study refers to the medical record form used by the hospital.

In the third stage, the Delphi technique was employed to validate the identified data elements through a survey of medical experts. A questionnaire was designed to determine data elements in both administrative and clinical departments. The questionnaire included administrative data elements and clinical data elements. A five-point Likert scale was used to measure the response of items (very much, much, somehow, little, very little). Moreover, one open-ended question (blank row) was set at the end of the data elements related to each class, to allow the experts to add any extra data deemed essential for the electronic health record system (EHRS).

The expert selection criteria were knowledge related to medical records and medical services. The selection of experts for the Delphi technique was done through the purposive sampling method. Overall, 8 (eight) experts were chosen in this step (Table 2).

Table 2. Demographic characteristics of participants in the study

Demographic Characteristic	Amount
Speciality	
Medical Record	2
Physician	2
Nurse	2
Nutritionist	2

The criterion for selecting a data element in the questionnaire was 75% consensus of experts over that. In the first stage of Delphi decision-making, the data elements with a consensus of less than 50% were removed. Also, the data elements within 50%-70% were re-examined in the second stage, and in case of acquiring more than 75% consensus, that element was considered the final element.

RESULTS

To prepare the desired MDS, two Delphi decision-making stages were done. In the first stage, 910 data elements were proposed, which included 37 elements for the administrative data and 873 for the clinical branch. In the groups of administrative data, 9 data elements were eliminated out of the 37 proposed ones, due to less than 50%

consensus among the experts. Moreover, 21 data elements related to the administrative data underwent a second opinion in the second stage of the Delphi study due to 50%–75% agreement among the experts.

Among the 873 proposed elements for the group of clinical data, only 3 data elements were eliminated. Further, the experts were asked again about 25 data elements, due to 50%–75% agreement over them. In the second stage of the Delphi method, a total number of 46 data elements (21 administrative data and 25 clinical data in 50%–75% agreement in the first stage) were provided to the experts and all of the data elements were approved. The final model included 898 data elements (28 administrative and 870 clinical data elements) which are summarized in Tables 3 and 4.

Table 3. Administrative Data Elements

Administrative Data Class	**suggest D.E**	**< 0.5%**	**50-75%**	**> 75%**		**< 0.5%**	**50-75%**	**> 75%**	**Final D.E**
Demography	8	0	4	4		0	0	4	8
Socio economy	7	0	7	0		0	0	7	7
Residence	5	2	2	1		0	0	2	3
Patient Referral Data	9	3	5	1		0	0	5	6
Healthcare Identifier	8	4	3	1		0	0	3	4
TOTAL	**37**	**9**	**21**	**7**		**0**	**0**	**21**	**28**

Table 4. Clinical Data Elements

Clinical Data Class	**Suggested D.E**	**< 0.5%**	**50-75%**	**> 75%**		**< 0.5%**	**50-75%**	**> 75%**	**Final D.E**
Nurse General Initial Assessment	107	0	4	103		0	0	4	107
Initial Assessment of Neonatal Nurses	117	0	5	112		0	0	5	117
Initial Assessment of Psychiatric Nurses	85	0	0	85		0	0	0	85
Doctor General's Initial Medical Assessment	59	0	4	55		0	0	4	59
Preliminary Medical Assessment of obstetrics and gynecology Doctors	73	0	7	66		0	0	7	73
Psychiatric Doctor's Initial Medical Assessment	113	0	0	113		0	0	0	113
Pre-Operation Assessment	41	0	0	41		0	0	0	41
Pre- Anesthesia Assessment	56	0	0	56		0	0	0	56
Post Operation Assessment	56	0	0	56		0	0	0	56

Post-Anesthesia Assessment	13	0	0	13		0	0	0	13
Initial Nutrition Assessment	29	1	0	28		0	0	0	28
Integrated Patient Examination Records	14	0	4	10		0	0	4	14
Consultation	8	0	0	8		0	0	0	8
Diagnose & Procedure	4	0	0	4		0	0	0	4
Laboratory Examination	6	0	0	6		0	0	0	6
Radiology Examination	6	0	0	6		0	0	0	6
Prescription	17	1	0	16		0	0	0	16
Operations Team	3	0	0	3		0	0	0	3
Inform Consent	19	1	0	18		0	0	0	18
General Medical Resume	26	0	0	26		0	0	0	26
Surgical Medical Resume	21	0	1	20		0	0	1	21
TOTAL	**873**	**3**	**25**	**845**		**0**	**0**	**25**	**870**

The detailed list of administrative and clinical data elements in the final model are reported in Tables 5 and 6.

Table 5. Content of Administrative Data Elements

Administrative Data Class	Administrative Data Elements
Demography	identity/passport number, med rec number, patient name, patient father's name, sex, nationality, place of birth, date of birth
Socio economy	education degree, employment status, type of job, job description, average working hours/week
Residence	type of residence, address, mobile phone number
Patient Referral Data	medical appointment, type of visit, date of registration, service provider, referral number
Healthcare Identifier	Id healthcare, healthcare name, healthcare type/class

Table 6. Content of Clinical Data Elements

Clinical Data Class	Clinical Data Elements
Nurse General Initial Assessment	Patient ID, Nurse ID, Service ID, Complaints, Current Disease History, Past Disease History, Family Disease History, Allergy History, Consciousness Level, Blood Pressure, Temperature, O2 Saturation, Weight, Height, Pain Assessment Score, Fall Risk Score, Nursing Problem Diagnosis, Care Plan and Implementation
Initial Assessment of Neonatal Nurses	Patient ID, Nurse ID, Service ID, Complaint, Family Child Referral, Meconium Aspiration, Umbilical Cord Prolapse, Amniotic Fluid Rupture Time, Family Disease History, Mother's Age, Type of Childbirth, Weight Before Pregnancy, Weight During Pregnancy, Habits During Pregnancy,

	Baby Weight, Baby Length, Level of Consciousness, Blood Pressure, O2 Saturation, Grasp Reflex, Crying Reflex
Initial Assessment of Psychiatric Nurses	Patient ID, Nurse ID, Service ID, Marital Status, Family Existence, Activities, Suspicions of Abuse/Neglect, Emotional Status, Religion, Educational History, Patient and Family Health History, Self-Concept, Appearance, Conversation, Feelings, Interactions in Interviews, Perception, Thought Flow, Memory, Concentration Level, Suicide Risk, Suicide Risk Category, Violence Risk, Violence Risk Category, Protective Factor, Nursing Diagnosis, Nursing Management Plan
Doctor General's Initial Medical Assessment	Patient ID, Physician ID, Service ID, Complaints, Current Disease History, Past Disease History, Family Disease History, Allergy History, Consciousness Level, Blood Pressure, Temperature, O2 Saturation, Weight, Height, Pain Assessment Score, Fall Risk Score, Nutritional Status, General Condition, Physical Examination, Laboratory Examination, Radiology Examination, Primary Diagnosis, Additional Diagnosis, Management, Advanced Examination, Care Plan, Local Status
Preliminary Medical Assessment of obstetrics and gynecology Doctors	Patient ID, Physician ID, Service ID, Complaints, Current Disease History, Past Disease History, Family Disease History, Allergy History, Surgery History, Transfusion History, Trauma History, Consciousness Level, Blood Pressure, Temperature, O2 Saturation, Weight, Height, Pain Assessment Score, Fall Risk Score, Nutritional Status, General Condition, Physical Examination, obstetrics and gynecology Status, Clinical Pelvimetry, Laboratory Examination, Radiological Examination, Primary Diagnosis, Additional Diagnosis, Management, Advanced Examination, Care Plan, Local Status
Psychiatric Doctor's Initial Medical Assessment	Patient ID, Physician ID, Service ID, Main Complaint, Current Mental Disorder History, Past Mental Disorder History, Genogram, Drug History, Personality History Before Illness, Mental Treatment History, Appearance, Awareness, Orientation, Behavioral Attitudes, Thinking Process, Thought Content, Mood, Affect, Hallucinations, Illusions, Concentration Power, Memory, Level of Trustworthiness, Menigeal Signs, Cranial Nerves, Motor System, Vegetative, Laboratory and Radiological Examinations, Panss EC, GAF Score, Psychiatric Diagnosis, Medical Rehab Procedures, Therapy, Follow-up Plan
Pre-Operation Assessment	Surgery ID, Patient ID, Surgery Time, Respiration, O2 Saturation, Blood Pressure, Pulse, Temperature, Consciousness Level, Action Plan, Implementation, Orientation Evaluation, Vital Evaluation, Surgical Tools Evaluation, Antibiotic Evaluation
Pre-Anesthesia Assessment	Anesthesia ID, patient ID, pre-operative diagnosis, action plan, anamnesis, anesthesia history, systole, diastole, pulse, respiratory, temperature, respiratory system, cardio system, hepatic system, ECG examination, anesthesia risk, anesthesia plan, pre-medication
Post Operation Assessment	Surgery ID, Patient ID, Entry Time, Exit Time, Respiration, O2 Saturation, Pulse, Temperature, Consciousness Level, Pain Scale, Pain Location, Action Plan, Implementation, Pain Evaluation, Pulse Evaluation, Respiratory Evaluation, Therapy Evaluation, Analgetic Evaluation
Post-Anesthesia Assessment	Anesthesia ID, Patient ID, Entry Hours, Exit Hours, Tools Type, Tools Score, Infusion, Transfusion, Analgetic Program
Surgery Registration	Surgery ID, Registration ID, Employee ID, Diagnose
Inform Consent	Inform consent ID, patient ID, performing physician, informant, witness, officer witness, diagnosis, name of medical procedure, type of action, risk, prognosis, statement

Initial Nutrition Assessment	Patient id, service id, nutritionist id, medical diagnosis, malnutrition risk category, special conditions, dietary prescription, weight, height, nutritional status, general clinical, clinical complaints, dietary history of food intake, dietary history of food abstinence, intervention, monitoring evaluation
Integrated Patient Examination Records	Patient id, service id, employee id, SOAP, Instruction, Physician verifier id, Physician verification date
Consultation	Consultation ID, Service ID, Consular Doctor, Diagnosis, Clinic History, Type of Consultation, Destination Unit, Consular Destination Doctor
Diagnose & Procedure	ICD 10 code, ICD 10 description, ICD 9 code, ICD 9 description
Laboratory Examination	Lab ID, Service ID, Unit, Doctor, Diagnosis, Lab Record
Radiology Examination	Rad ID, Service ID, Unit, Doctor, Diagnosis, Rad Record
Prescription	Prescription ID, Service ID, Patient ID, Doctor ID, Pharmacy ID, Chronic Status, Concoction Status, Diagnosis, Quantity, Dosage, Dosage, Instructions
General Medical Resume	Resume ID, service ID, patient ID, doctor ID, complaints, disease history, vital sign examination, lab examination, radiology examination, primary diagnosis, action, discharge status, follow-up plan
Surgical Medical Resume	Surgery ID, Service ID, Patient ID, Pre-Operative Diagnosis, Primary Diagnosis, Operating Hours Started, Surgical Procedure, Surgical Procedure, Surgical Procedure, Surgical Details, Instructions

DISCUSSION

The proposed minimum data set (MDS) of the National electronic health record has administrative and clinical sections. However, the content of the MDS in this study is different from the MDS from the results of the study or MDS in other developed countries. The technical preparation of MDS in this study follows the process of medical services provided to a patient from the beginning of admission to the completion of receiving services at the hospital [15]. The MDS developed here is more extensive than comparable minimum data sets from hospitals in Iran [9], Australia [10], India [11], and the United States [12] which produce more data elements.

In this study, the administrative data were categorized into 5 different data classes. The first class of this data set is demographics. In this section, there are several data elements including identity/passport number, medical rec number, patient name, patient father's name, sex, nationality, place of birth, and date of birth. These data elements are used in most minimum data sets in countries with ethnic and migratory populations such as the United States [12].

In the class of socioeconomy, some data elements related to patient socioeconomy are education degree, employment status, type of job, job description, and average working hours/week. Most of these data elements are similar to data elements for admission in other studies in the Islamic Republic of Iran [9] and the minimum data sets of other countries [9]-[13]. In the classs of residence, type of residence, address, and mobile phone number are the proposed data elements.

In the class of patient referral data, medical appointment, type of visit, date of registration, service provider, and referral number are the proposed data elements. Followed by Id healthcare, healthcare name, and healthcare type/class as part of the data class of healthcare identifier. These data are similar to the financial data elements in most minimum data sets in other countries [9]-[13].

The proposed clinical section had 18 data classes. Compared with similar minimum data sets in other countries [9]-[13][16], our proposed clinical data set has more data elements. We tried to include as many clinical data elements of the patient's medical record as possible.

In contrast to the MDS of other countries, the nurse assessment data class is divided into 3 types, according to the medical services provided by the nurse, including the initial assessment data class of general nurses, the initial assessment of neonatal nurses, and the initial assessment of psychiatric nurses. The general nurse initial assessment data class was the first class of the clinical section with 107 data elements. This class includes anamnesis, physical examination, vital sign examination, nursing problems, nursing intervention, and nursing care plan. This data element is generally the content of nursing assessments that are used according to the world's health service standard [17].

The neonatal nurse initial assessment class is a data class that represents the need for data in the medical service process for babies born prematurely commonly called neonatal services. Data elements that distinguish it from the general nurse assessment include the order of the child in the family, meconium aspiration, umbilical cord prolapse, time of amniotic fluid rupture, family history of disease, mother's age, type of childbirth, weight before pregnancy, weight during pregnancy, habits during pregnancy, baby's weight,

baby length, baby's level of consciousness, baby's grip reflex, baby's crying reflex and others. This is the data class with the highest number of data elements from other data classes, which is as many as 117 data elements. The data element in this data class also refers to the neonatal nursing assessment used in various health services [18]-[19].

The initial psychiatric nursing assessment data class is a data class that represents data needs for medical services for patients with mental disorders, generally, these services are provided in mental hospitals with data elements including Family Existence, Activities, Suspicions of Abuse/Neglect, Emotional Status, Religion, Educational History, Patient and Family Health History, Self-Concept, Appearance, Conversation, Feelings, Interactions in Interviews, Perception, Thought Flow, Memory, Concentration Level, Suicide Risk, Suicide Risk Category, Violence Risk, Violence Risk Category, Protective Factor, Nursing Diagnosis, Nursing Management Plan. This reference is taken from several studies related to psychiatric medical services [20]–[24].

Furthermore the data class for services provided by doctors, including the data class of general medical initial assessment, neonatal medical initial assessment, and psychiatric medical initial assessment. The general medical initial assessment data class has 59 data elements including previous disease history, family disease history, allergy history, nutritional status, physical examination, laboratory examination, radiological examination, primary diagnosis, additional diagnosis, management, advanced examination, care plan, and local status. This data element is generally the content of the initial medical assessment used according to health service standards in other studies [16][17].

All data elements in the general medical initial assessment data class are also found in the neonatal initial medical assessment data class. What distinguishes this class is the existence of data elements: pregnancy status, and clinical pelvimetry which is useful for representing the patient's pregnancy condition. The data elements in the neonatal medical assessment data class are referenced from the common and specific neonatal studies [18]-[19].

In contrast to the data class in the general and neonatal medical initial assessment, the psychiatric initial medical assessment data class focuses on medical services for patients with mental disorders, and has 113 data elements including Current Mental Disorder History, Past Mental Disorder History, Genogram, Drug History, Personality History Before Illness, Mental Treatment History, Appearance, Awareness, Orientation, Behavioral Attitudes, Thinking Process, Thought Content, Mood, Affect, Hallucinations, Illusions, Concentration Power, Memory, Level of Trustworthiness, Menigeal Signs, Cranial Nerves, Motor System, Vegetative, Laboratory and Radiological Examinations, Panss EC, GAF Score, Psychiatric Diagnosis, Medical Rehab Procedures, Therapy, Follow-up Plan [20]–[24].

The next class of data is for the assessment of medical services in the operating room, divided into two types of services, namely surgical medical services and anesthesia medical services. Surgical medical services consist of pre-operative assessment data classes and post-surgical assessments. Referring to the literature on surgery [25]-[26], the data elements in the preoperative assessment class include operation time, respiration, O2 saturation, blood pressure, pulse, temperature, level of consciousness, action plan, implementation, orientation evaluation, vital evaluation, surgical tools evaluation, antibiotic evaluation. What is bold with data elements in the postoperative assessment class includes pain scale, pain location, action plan, implementation, pain evaluation, pulse evaluation, respiratory evaluation, therapy evaluation, and analgetic evaluation.

Meanwhile, medical anesthesia services, it is divided into pre-anesthesia assessment data classes and post-anesthesia assessment data classes. Referring to the literature on anesthesia studies [25]-[27], the pre-anesthesia assessment data class consists of data elements: pre-operative diagnosis, action plan, anamnesis, anesthesia history, systole, diastole, pulse, respiratory, temperature, respiratory system, cardio system, hepatic system, ECG examination, anesthesia risk, anesthesia plan, premedication. Meanwhile, what distinguishes it from the post-anesthesia assessment data class are the data elements: entry hours, exit hours, types of tools, tool scores, infusions, transfusions, and analgetic programs.

The last data class that is included in the assessment category is the nutrition assessment data class which contains data elements: malnutrition risk category, special conditions, dietary prescription, weight, height, nutritional status, general clinical, clinical complaints, dietary history of food intake, dietary history of food abstinence, intervention, monitoring evaluation [28]–[31].

After all classes of assessment data are identified, it continues to the class of integrated patient development records which contains data elements regarding Subject, Object, Action, and Planning referring to the international standard for writing integrated patient development records [16]-[32]. The Consultation data class is required for the consultative process with other doctors in handling a patient, with data elements including consular doctor, diagnosis, clinical history, type of consultation, destination unit, and consular destination doctor.

Diagnosis and Procedure are two important data classes that must be present in the medical service process referring to many existing MDS [16]-[32], where each data class contains data elements regarding the description of the diagnosis along with the ICD-10 code and the description of the procedure along with the ICD-9 code [34]–[39]. The other two data classes that fall under the pre-clinical data category are the Laboratory and Radiology data classes. Each data class contains data elements: sending unit, doctor, diagnosis,

laboratory record, or radiology record. Some other studies have included most of these data [32] [40] [41].

The important data class at the end of the medical service process is the resume data class, which is divided into the general medical resume data class and the post-surgical medical resume. Referring to MDS in various studies [16]-[32] the data element in the general medical resume data class, contains about: lab examination records, radiological examination records, primary diagnosis, actions, discharge status, and follow-up plans. Meanwhile, the data element in the postoperative medical resume (surgery) data class contains data on preoperative diagnosis, primary diagnosis, operating hours, surgical procedures, surgical actions, surgical details, and instructions, referring to the international surgical MDS [16]-[32].

CONCLUSION

The MDS development is the first fundamental step to establishing electronic health record systems in Indonesia. The MDS of Indonesia is developed based on reviewing literature review and applying two decision Delphi technique rounds. This MDS could be a reliable tool for data standardization in electronic health record systems that can improve the quality of data and, thus care and services related to medical services in hospitals. Therefore, decision-makers, policy-makers, and information system vendors can use this tool as a prerequisite for the selection or development of an electronic health record system.

REFERENCES

1. F. A. Bernardi *et al.*, "The Minimum Data Set for Rare Diseases: Systematic Review," *J. Med. Internet Res.*, vol. 25, pp. 1–13, 2023, doi: 10.2196/44641.
2. N. Hashemi, A. Sheikhtaheri, N. sadat Hashemi, and R. Rawassizadeh, "Electronic medical records for mental disorders: What data elements should these systems contain?," *Stud. Health Technol. Inform.*, vol. 260, pp. 25–32, 2019, doi: 10.3233/978-1-61499-971-3-25.
3. L. Lang, R. P. Moser, J. Odenkirchen, and D. Reeves, "Common Data Elements (CDEs)," vol. 13, no. 6, pp. 671–676, 2017, doi: 10.1177/1740774516653238.Improving.
4. E. Soleimani, M. Ahmadi, A. Mohammadi, and J. Alipour, "Development of minimum data set (MDS) for an information management system for aged care centers in Iran," *Informatics Med. Unlocked*, vol. 25, p. 100695, 2021, doi: 10.1016/j.imu.2021.100695.
5. M. Ahmadi, T. Madani, and J. Alipour, "Development a national minimum data set (MDS) of the information management system for disability in Iran," *Disabil. Health J.*, vol. 12, no. 4, pp. 641–648, 2019, doi: 10.1016/j.dhjo.2019.05.008.
6. R. Abbasi, R. Khajouei, and M. Mirzaee, "Evaluating the demographic and clinical minimum data sets of Iranian National Electronic Health Record," *BMC Health Serv. Res.*, vol. 19, no. 1, pp. 1–10, 2019, doi: 10.1186/s12913-019-4284-x.
7. Z. S. Nezamodini, Z. Rezvani, and K. Kian, "Identification of the necessary data elements to report AIDS: a systematic review," *Electron. Physician*, vol. 9, no. January, pp. 3592–3597, 2017.
8. J. Zarei, A. Mohammadi, M. R. Akrami, and A. Jeihooni Kalhori, "Designing a minimum data set for the information management system (registry) of spinal canal stenosis: An applied-descriptive study," *Heal. Sci. Reports*, vol. 6, no. 11, 2023, doi: 10.1002/hsr2.1671.
9. Z. Rampisheh, M. E. Kameli, J. Zarei, A. V. Barzaki, M. Meraji, and A. Mohammadi, "Developing a national minimum data set for hospital information systems in the Islamic Republic of Iran," *East. Mediterr. Heal. J.*, vol. 26, no. 4, pp. 400–409, 2020, doi: 10.26719/emhj.19.046.
10. D. Definitions, *Victorian Emergency Minimum Dataset (VEMD) User Manual*. 2013.
11. Ministry of Health & Family Welfare, "EHR Standards for India," *India, M. H. F. W. G. eHealth Sect. (2016). Electron. Heal. Rec. Stand. India*, pp. 1–48, 2016, [Online]. Available: http://www.mohfw.nic.in/showfile.php?lid=4138
12. V. J. M. Watzlaf, X. Zeng, C. Jarymowycz, and P. A. Firouzan, "Standards for the content of the electronic health record.," *Perspect. Heal. Inf. Manag.*, vol. 1, p. 1, 2004, [Online]. Available: http://www.ncbi.nlm.nih.gov/pubmed/18066381%0Ahttp://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=PMC2047330
13. N. Davaridolatabadi, M. Shahi, F. Sadoughi, and M. Ahmadi, "The comparison of the minimum data set for elderly health in selected countries," *Acta Inform. Medica*, vol. 23, no. 6, pp. 393–397, 2015, doi: 10.5455/aim.2015.23.393-397.
14. S. Shahin *et al.*, "Multiple sclerosis national registry system in Iran: Validity and reliability of a minimum data set," *Mult. Scler. Relat. Disord.*, vol. 33, no. May, pp. 158–161, 2019, doi: 10.1016/j.msard.2019.06.009.
15. Kemenkes RI, "Blueprint for Digital Health Transformation Strategy Indonesia 2024," *Kemenkes RI*, 2021.
16. Centers For Medicare & and Medicaid Services, "Long-Term Care Facility Resident Assessment Instrument User's Manual," 2008.
17. P. Manual, *Module 3 Initial patient*.
18. H. L. Lindroth *et al.*, "Information and Data Visualization Needs among Direct Care Nurses in the Intensive Care Unit," *Appl. Clin. Inform.*, vol. 13, no. 5, pp. 1207 – 1213, 2022, doi: 10.1055/s-

0042-1758735.
19. S. Zakerabasali *et al.*, "Development and validation of the Neonatal Abstinence Syndrome Minimum Data Set (NAS-MDS): a systematic review, focus group discussion, and Delphi technique," *J. Matern. Neonatal Med.*, vol. 35, no. 4, pp. 617–624, 2022, doi: 10.1080/14767058.2020.1730319.
20. P. Mental, H. Care, and M. Data, "Global Primary Mental Health Care," *Glob. Prim. Ment. Heal. Care*, 2019, doi: 10.4324/9780429026386.
21. Z. Ebnehoseini, M. Meraji, A. R. Ardani, F. Akbarzadeh, and M. Irajzade, "Developing a minimum data set of psychiatric emergency record.," *J. Fundam. Ment. Heal.*, vol. 24, no. 4, pp. 223–230, 2022, [Online]. Available: https://search.ebscohost.com/login.aspx?direct=true&db=asn&AN=159540548&site=ehost-live
22. European Commission, "Proposed set of mental health indicators; definitions, description and sources," *Natl. Res. Dev. Cent. Welf. Heal. , Helsinki.*, p. 15, 2000, [Online]. Available: http://ec.europa.eu/health/ph_projects/1998/monitoring/fp_monitoring_1998_annexe2_09_en.pdf
23. S. Mohebi, M. Parham, G. Sharifirad, and Z. Gharlipour, "Social Support and Self - Care Behavior Study," no. January, pp. 1–6, 2018, doi: 10.4103/jehp.jehp.
24. D. Ph, M. Pahor, M. D. D. Ph, S. Dekosky, and A. G. Winterstein, "Symptoms with Clinical Diagnosis in a Nursing Home," vol. 25, no. 10, pp. 1897–1902, 2022, doi: 10.1080/13607863.2020.1758921.Agreement.
25. M. Jokar, M. A. Sahmeddini, F. Zand, R. Rezaee, and A. Bashiri, "Development and evaluation of an anesthesia module for electronic medical records in the operating room: an applied developmental study," *BMC Anesthesiol.*, vol. 23, no. 1, pp. 1–11, 2023, doi: 10.1186/s12871-023-02335-2.
26. F. Freguia, M. Danielis, R. Moreale, and A. Palese, "Nursing minimum data sets: Findings from an umbrella review," *Health Informatics J.*, vol. 28, no. 2, 2022, doi: 10.1177/14604582221099826.
27. H. M. Ahmed *et al.*, "Recommendations for effective documentation in regional anesthesia: An expert panel Delphi consensus project," *Reg. Anesth. Pain Med.*, vol. 47, no. 5, pp. 301–308, 2022, doi: 10.1136/RAPM-2021-103136.
28. S. J. Håkonsen, P. U. Pedersen, A. Bygholm, and M. D. J. Peters, "Speaking the same language : Development of a Nutrition Minimum Data Set for healthcare professionals in primary healthcare," 2020, doi: 10.1177/1460458218824707.
29. P. U. Pedersen, M. Bjerrum, A. Bygholm, M. D. J. Peters, and S. J. Ha, "Nursing Minimum Data Sets for documenting nutritional care for adults in primary healthcare : a scoping review," pp. 117–139, 2018, doi: 10.11124/JBISRIR-2017-003386.
30. E. Reber, F. Gomes, M. F. Vasiloglou, and P. Schuetz, "Nutritional Risk Screening and Assessment," pp. 1–19.
31. M. Gurinovi, "Nutrition Epidemiology and Public Health Nutrition," pp. 1–6, 2016, doi: 10.1016/B978-0-08-100596-5.03491-0.
32. M. Karami, N. Hafizi, A. M. Nickfarjam, and S. Refahi, "Development of minimum data set and dashboard for monitoring adverse events in radiology departments," *Heliyon*, vol. 10, no. 9, p. e30054, 2024, doi: 10.1016/j.heliyon.2024.e30054.
33. U. S. Government, "ICD-9-CM," no. 112.
34. D. J. Cartwright, "ICD-9-CM to ICD-10-CM Codes: What? Why? How?," *Adv. Wound Care*, vol. 2, no. 10, pp. 588–592, 2013, doi: 10.1089/wound.2013.0478.
35. G. Hernandez-Ibarburu *et al.*, "ICD-10-PCS extension with ICD-9 procedure codes to support integrated access to clinical legacy data," *Int. J. Med. Inform.*, vol. 122, pp. 70–79, 2019, doi: 10.1016/j.ijmedinf.2018.11.002.
36. HSCIC Clinical Classifications Service, "National Clinical Coding Standards ICD-10. 5th edn," 2016.
37. T. Revision and S. Edition, "ICD-10 classification," *Bmj*, vol. 341, p. c4116, 2010, doi: 10.1136/bmj.c4116.
38. A. J. Mainor, N. E. Morden, J. Smith, S. Tomlin, and J. Skinner, "ICD-10 Coding Will Challenge Researchers: Caution and Collaboration may Reduce Measurement Error and Improve Comparability Over Time," *Med. Care*, vol. 57, no. 7, pp. E42–E46, 2019, doi: 10.1097/MLR.0000000000001010.
39. C. Wang, C. Yao, P. Chen, J. Shi, Z. Gu, and Z. Zhou, "Artificial Intelligence Algorithm with ICD Coding Technology Guided by the Embedded Electronic Medical Record System in Medical Record Information Management," *J. Healthc. Eng.*, vol. 2021, 2021, doi: 10.1155/2021/3293457.
40. F. Shahbakhsh, R. Khajouei, A. Sabahi, Y. Mehdipour, and L. Ahmadian, "Designing a minimum data set of laboratory data for the electronic summary sheet of pediatric ward in Iran: A cross-sectional study," *Heal. Sci. Reports*, vol. 6, no. 6, pp. 1–11, 2023, doi: 10.1002/hsr2.1315.
41. Z. Arabkermani *et al.*, "Developing a minimum data set required to create a registry system for patients with vitiligo," *Heliyon*, vol. 8, no. 12, 2022, doi: 10.1016/j.heliyon.2022.e12641.