



Developing a Minimum Data Set for Orthodontic Information Management: A Review of Evidences

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Abstract

Background: One of the problems in the oral health is lack of coordination and misalignment of teeth, so orthodontic treatments were performed to treat this issue. This treatment is time consuming and the need to document the processes is strongly felt. Dental information management can improve the quality of dental care and reduce the costs by preventing re-procedures. To manage the orthodontics information, the present study aimed to review a minimum orthodontics data set.

Methods: This review study was performed using the guidelines and related articles conducted from 2001 to September 2021 through scientific databases and search engine (PubMed, ProQuest, Wiley, Google Scholar, Scopus and Science Direct) using keywords including (minimum data set, health information management, dental records, orthodontics, orthodontic records, malocclusion, and maxillofacial malformations).

Results: According to studies, demographic data, general evaluation, extra and intra oral examination, functional examination, temporomandibular joint condition, cephalometric data, cast analysis, evaluation data and treatment plan, progress note, unit summary, dental history, and type of orthodontic treatment have suggested as minimum orthodontics dataset.

Conclusion: Developing minimum dataset as a standard approach for better understanding and comparing the data is necessary in the health information management. The present study proposes a minimum data set for implementation of orthodontic information system in Iran. This system will play an important role in improving the oral health indicators of the community and provide access to an electronic health record.

Keywords: MDS, Minimum Dataset, Orthodontic Record, Dental Record, Health Information Management

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Introduction

Oral health is one of the most important aspects of personal health (1). There are several problems associated with oral health; one of these problems is malocclusion (2). Malocclusion is one of the most common maxillofacial malformations in most countries (3). Studies showed that 43.82% of people with malocclusion need orthodontic treatment (4). Orthodontics is a type of dental specialty that examines and treats maxillofacial malformations and malocclusion (5). Also, therapeutic progress in orthodontics depends on the accurate evaluation of treatment results in order to evaluate and quantify changes, records and measurements are obtained

and compared at different times (6). As a result orthodontic treatment plans should be evidence-based and requires a special dental record to store treatment's document (7). In this regard and in the specialized field, orthodontic records are mainly used to monitor the growth and development of the face, with or without orthodontic treatment. It also plays an important role in research and clinical auditing (8). It is also valuable to be able to compare a particular patient's problem with other registered patients with a similar problem to see how it has been treated more successfully. For example, different treatment programs to correct the same type of malocclusion are likely to have different distributions of results (9-11).

Orthodontic information management provides the basis for the registry of information and electronic dental record (12, 13). The patient's electronic record data can be reused while removing barriers and limitations. Reusing data can help improve eligibility and registration of eligible patients, data management, and data validation (14-16). By providing researchers with rapid access to clinical data, making useful patient file information available for clinical, epidemiological research, and reducing or eliminating secondary data entry we can reduce research costs, improve efficiency, and allow longitudinal data collection during national studies (17-20).

Electronic data and their storage in databases have necessitated the use of a minimum set (21). The minimum data set is the first important step in the development of the health care information system because it creates a standard way to collect key data elements in a file (22). Also, the minimum data set is the main set of data elements agreed upon by the National Health Information Management Group to collect and report the data at the national level; this plays an important role in the healthcare industry for the exchange of health-related data and the global implementation of electronic health records (23). Providing a minimum of variables related to the health status of individuals, including demographic, clinical, and patient care plan data facilitates the establishment of appropriate communication between care providers and timely decision-making for managers (24).

The American Orthodontic Association also provides some essential data elements for the orthodontic record in the orthodontic guidelines (25). The British Orthodontic Society states the purpose of determining the minimum orthodontic data set to ensure that all patients have received effective treatment (26). However, in Iran, unfortunately, the collection of dental data is associated with many restrictions. One of the important issues in this regard is the lack of a proper data collection system that includes appropriate information elements. Designing and implementing a comprehensive and appropriate orthodontic data set model in Iranian can be an important step in the quality and appropriate treatment and regular planning to control and prevent oral diseases (27). Therefore, the purpose of this study was to introduce the national orthodontic minimum data set.

Material and Methods

Identify the Research Question

What is the minimum data set in Orthodontics?

Search Strategy

This review study was conducted by searching articles and guidelines from 2001 to September 2021 in scientific databases and search engines (SCOPUS, Pub MED, Google Scholar, ProQuest, Wiley, Science Direct) and by using keywords such, MDS, minimum data set, orthodontic, orthodontic record, Malocclusion, dental record, EDR, EHR, health information management.

Inclusion criteria were English and full texts of related articles and guidelines based on search key words between 2001 to September 2021. Non-English and unavailable full texts as well as the studies not defined as a journal article were excluded from this study.

Selection Criteria and Evaluation of Article Quality

Initially, according to the existing keywords, the database was checked. Then, by reviewing the abstract and in case of similarity with the desired subject, the original and full text articles were read if available. In addition, the guidelines of orthodontic associations in Europe, the United States, and the United Kingdom and the existing registries were reviewed. The reason for choosing these countries was their leadership and availability of the guidelines of their orthodontic associations.

Iranian orthodontic records were also reviewed through private office forms. The data elements which extracted from review study and orthodontic records checked and approved by two orthodontic specialists.

Results

By applying search strategy in present study, the

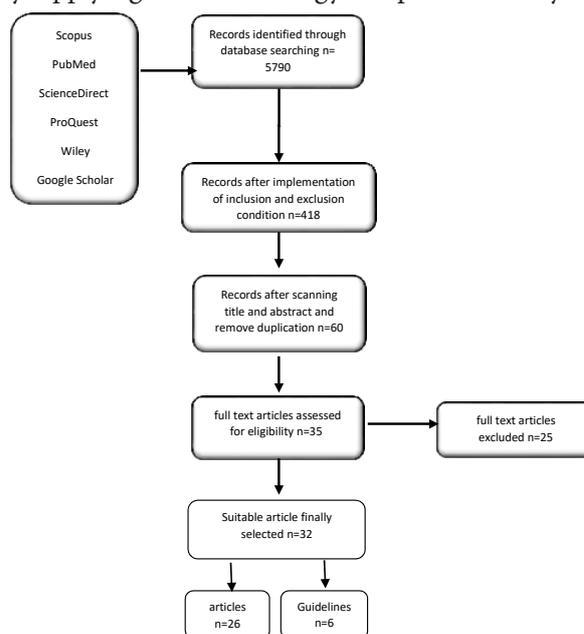


Figure 1: Flow diagram regards to the search, inclusion and exclusion of studies

Table 1: Proposed orthodontic minimum data elements

Row	Sections	Data elements	References
1	Demographic data	Family Name, Name, Father Name, Date of birth, Gender, Date of Admission	(9, 22, 24, 28-33)
2	General Evaluation	Chief Complaint, Posture, Gait	(24, 26, 28, 30, 33-37)
3	Extra Oral Examination	Frontal view, Facial type, Vertical facial thirds, Profile view, Lip posture, Nose, Smile Analysis	(24, 30, 32, 33, 36, 37)
4	Intra Oral Examination	Height-Width relationship of central incisors, Evaluation of oral health, Hygiene, Teeth position, Periodontal Status, Occlusal, Cleft	(24, 28, 32, 33, 36, 37)
5	Functional Examination	Neuromuscular disease, Mastication, Speech, Breathing, Habits	(24, 37, 38, 39)
6	Temporomandibular joint (TMJ)	Pain, Sound, Tenderness to palpation, Mandibular shift	(32, 37, 39)
7	Cephalometric findings	Maxillary/Mandibular, relationship, Incisor inclination, Skeletal Analysis, Dental Analysis, Soft Tissue	(6, 24, 37, 40, 41, 42)
8	Cast analysis	Mandibular Space Analysis, Maxillary Space Analysis, Tooth Size analysis, Transverse relationship, Arch	(6, 24, (42-44)
9	Evaluation data and treatment plan	Diagnostic List, Possible Solutions, Final Problem Treatment	(9, 24, 28, 33, 39, 42, 44-49)
10	Progress notes	Date, Treatment Progress	(27, 33, 44, 49-51)
11	Unit summary	Final Diagnosis, Treatment Plan, Treatment progress, Recommendations after, Discharge	(9, 28, 33, 44, 52, 53)
12	Dental history	Syndromic, Type of Malocclusion, Cleft	(9, 28, 32, 33, 44, 49)
13	Type of orthodontic treatment	Fix, Removable, Removable+Fix, Orthosurgery	(37, 38, 39, 52, 54)

authors found 32 relevant studies (26 articles + 6 guidelines). Figure 1 shows the search process, inclusion and exclusion of studies. By reviewing selected articles and guidelines, 59 data elements were retrieved and divided in 13 sections according to minimum dataset type. Then they were approved by two orthodontist. Table 1 shows proposed orthodontic minimum data element for developing orthodontic information system.

According to Table 1, general evaluation, evaluation data and treatment, and demographic data were mentioned in more sources, while cast analysis, temporomandibular joint (TMJ), and functional examination were mentioned in fewer sources due to their specialization.

Discussion

The goal of this study is to review orthodontic data elements and propose minimum dataset in orthodontic treatment. Designing minimum dataset is very useful to create an orthodontic record, maintain continuity of care, record regular procedures, aware physicians of what has been done and what needs to be done, and justify and support the need for appropriate medical care provided to individuals (55). Developing orthodontic minimum dataset improve information management of orthodontic patients and is necessary to implement orthodontic information system.

According to studies, orthodontic records should have a standard and structured information in 13

sections: 1. demographic data; 2. general evaluation; 3. extra oral examination; 4. intra oral examination; 5. functional examination; 6. temporomandibular joint (TMJ); 7. cephalometric findings; 8. cast analysis; 9. evaluation data and treatment plan; 10. progress notes; 11. unit summary; 12. dental history; and 13. type of orthodontic treatment.

Demographic data element is one of the most important elements of any dental file, which is also expressed in this study. This data element is the component of patient identification (9). The importance of this data element has also been expressed in the study of Sadoughi et al. (2017), Charangowda et al. (2010), and Sheiham et al. (2005) (24, 30, 31).

General evaluation is a valuable data element that the present study has also emphasized. Oral health information is used to prepare patient treatment plans (56). Research conducted by Foles et al. (2001), Nasser et al. (2010) and Cave et al. (2020) has confirmed the importance of this issue (26, 27, 50).

Extra oral examination and intra oral examination are important data elements in the field of orthodontics that the present study has confirmed its importance. Extra oral examination involves movement of the skin, lymph nodes, sinuses, masticatory muscles and mouth of the face, thyroid, temporomandibular joint, salivary glands and alike. Intra oral examination also includes information such as hard and soft palate, nostrils, tongue, mouth, Hard

tissues (bone structure, asymmetry, abnormalities, growth, and teeth that are congenitally lost, not pulled, and not pressed, destroyed, drifted, rotated), arch relationship and periodontal examination (50). The research of Samadpour et al. (2015) and Jerrold et al. (2015) confirmed this (36, 37).

Functional examination includes data on facial function status, which is an important element in orthodontic treatment and has been mentioned in the present study. This is important because functional problems can lead to problems eating certain foods, symptoms of temporomandibular joint dysfunction, or speech problems (38). Research carried out by Alam et al. (2014) indicates the need to record this element (39).

The temporomandibular joint (TMJ) determines the position of the facial joint. The functional examination should include hearing and touch from the TMJ. TMJ problems include clicking, creeping, chewing pain, muscle, limitation of jaw movement, excessive mobility and morphology, and other abnormalities (39). The research performed by Gerber et al. (2016) also confirms the importance of this issue (40).

Cephalometric findings related to the analysis of facial bones are an important element. Cephalometric data have a significant effect on physician's decision in determining the severity of some types of malocclusions in orthodontic treatment (41). Andani et al. (2015) research has emphasized the necessity of this data element (57).

Cast analysis, which examines the exact angles of the tooth through dental molds before the orthodontic process, is an essential data for documentation that the present study has expressed its importance. Dental plaster is traditionally used for orthodontic diagnosis and treatment planning. Tooth size, arc length difference, as well as jet and orbit excess are normally measured and recorded (43). Grauer (2011) and Cunha et al. (2021) research has shown the importance of this data element well (6, 45).

Evaluation data and treatment plan is to diagnose and select the treatment method. Its necessity is evident in the present study. Comprehensive records for orthodontic patients should include diagnosis, list of problems, treatment goals, treatment plan, treatment options, normal and abnormal clinical findings, description of treatment performed, referrals, follow-up treatment and recommendations, as well as documentation of all consultations, financial agreements and insurance forms. The goals of the patient's clinical chart are to maintain continuity of care, to record regular procedures, to remind physicians of what has been done and what

needs to be done, and to justify and support the need for medical treatment provided to appropriate individuals (55). The importance of this issue is very clear in the research of Singh et al. (2016), Lee et al. (2015), and Khorramian Tusi et al. (2014) and Chow et al. (2020) (46-48, 58).

Progress notes include treatment progress data, which is key data. Progress notes should be well-organized and legible, and provide a clear and comprehensive description of ongoing patient care. They should also indicate the reason for any treatment that is not easily known from the patient's history or illness. In other words, the orthodontist should fully document the patient's condition from the start of treatment and be honest in assessing treatment progress to date (50, 59). Research conducted by Morgan et al. (2001) has expressed the value of this data element in the minimum data set (44).

Unit summary records the data and the final diagnosis of the treatment performed for the patient, the necessity of which is clear in this study. Clinical records are essential to provide good dental care and to ensure the continuity and completeness of treatment. It also provides a complete record to monitor patients' oral health status and can also be used to help motivate preventive oral health measures. This is useful for monitoring the success / failure of any treatment (52). Research performed by Anderson et al. (2005) and Ireland et al. (2001) demonstrates the importance of this data element (49, 53).

Dental history is a valuable data mentioned in the results of this study. In addition to clinical findings, the patient record should include evidence of any significant dental history, including evaluation of dental caries and periodontal health. Information obtained from the patient's dental history can complement the clinical examination and help plan and determine the sequence of dental care that is necessary and appropriate to improve the patient's dental health (60). The research of Wagner et al. (2015) and Devadiga et al. (2014) has shown this issue (52, 54).

Type of orthodontic treatment includes information on the types of orthodontic treatment performed under the orthodontic treatment process, which has proven the importance of recording this issue in the present study. Orthodontic treatment is successful in achieving the treatment goal and the result remains constant. Unfortunately, teeth tend to return to their original position. In addition, due to growth and aging after puberty, changes occur in all individuals, with and without orthodontic treatment. Orthodontic retention is used in almost every patient

to maintain treatment results and prevent post-treatment dental changes. Different methods of dental care are used (54). Research by Rischen et al. (2013) also confirmed this (33).

Among the limitations of this research, we can mention lack of access to the full text of some articles, suitable guidelines or sources of information, and related studies in Iran.

Conclusion

In this study, by reviewing existing articles, guidelines, a set of data elements for orthodontic information management has been expressed. This minimum data set was presented in 13 sections: 1. demographic data; 2. general evaluation; 3. extra oral examination; 4. intra oral examination; 5. functional examination; 6. temporomandibular joint (TMJ); 7. cephalometric findings; 8. cast analysis; 9. evaluation data and treatment plan; 10. progress notes; 11. unit summary; 12. dental history; and 13. type of orthodontic treatment.

They are categorized to be considered when managing information. Gathering standard information in this field is very important due to its time consuming and production of a large amount of information in dental centers, especially orthodontic clinics in the health information management section. In this way, patients' data can be transferred to electronic oral health records, information transfer to other service providers, the importance of recording information fully in orthodontic records and data quality, and full use of statistical, epidemiological, and research studies. The patient can also benefit from advances in orthodontic treatment in the best way. European countries and the United States record these data elements with the aim of managing health information to improve quality at the national level, self-audit, and clinical governance in all sectors of the health industry.

Survey on orthodontic guidelines and registries from leading countries to design a minimum orthodontic data set and then validating it through orthodontists help us to propose a minimum data set for implementation of orthodontic information system in Iran. This system will play an important role in improving the oral health indicators of the community and provide access to an integrated health record.

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Ethical Considerations

Ethical issues (Including plagiarism, Informed Consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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