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RESEARCH ARTICLE

TRADITIONAL MEDICINAL PRACTICES OF AFRICAN BONE-SETTERS: ASPECTS OF AN ONTOLOGY OF THE FIELD

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Abstract

Traditional bone-setters (TBS) in West Africa remain the first resort in managing rural populations when they suffer from traumatic injuries before going to hospital. This phenomenon is also observed in urban areas. Indeed, some patients hospitalized in referencial public orthopedic trauma services desert these structures for certain reasons in favor of these traditional healers. This leads us to acknowledge that this local medical practice proves itself where the so-called conventional medicine has shown its limits. Unfortunately, we notice that most of these practitioners are old and illiterate. In addition, there is a lack of interest among the younger generation in practicing this traditional medicine. Also, it is observed that there is no standard or adequate formalism during the patient care process directed towards this medicine. In the effort to preserve this valuable knowledge, we propose to implement an ontology derived from this environment called ontoFRACTURECARE. This ontology is capable of structuring, highlighting, and providing a unique and consensus designation to relevant concepts associated with this domain. Furthermore, this ontology will serve as a compass for bone-setters and various users of this domain for intelligent decision-making during the process of administering care to patients, during the training of practitioners, and in the transmission of this traditional medicinal heritage.

Introduction:-

Traditional bone-setters (TBS) are practitioners of traditional medicine (TM) devoted to treating everyday accidents and unintentional injuries. In West Africa, they remain the first resort in managing the rural population (up to 85%, Omololu AB and al. 2008) when they suffer from fracture injuries before presenting themselvesto the hospital. This phenomenon is also observed to some extent in urban areas. Indeed, some patients hospitalized in public orthopedic-traumatology services of reference desert (desertion rates exceeding 8%, Abdoul WM and al. 2020) these structures in favor of these traditional healers, giving fundamental reasons such as the high cost of treatment, belief in the effectiveness of traditional treatment, religious or ethnic beliefs, slowness in patient care, and pressure from friends and family members (Abdoul WM and al.2020; Loukou Kouamé and al. 2021). This leads us to acknowledge that this popular medical practice proves itself where conventional medicine has shown its limitations. Unfortunately, we note that most of these practitioners are elderly and illiterate (illiteracy rates ranging from 65% to 80%, Dasylva B and al. 2001).In addition, there is a lack of interest among the younger generation in practicing this traditional

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medicine. Furthermore, there is a lack of standardization, formalism, and adequate knowledge base (KB) during the patient care process directed towards this medicine, sometimes leading to numerous complications, and the most common are limb amputations. Given all what is said above, we wonder how to perpetuate the knowledge of these African bone-setters.

The objective of this article is to propose an ontology derived from this environment called ontoFRACTURECARE. This ontology is capable of identifying and structuring data, providing a unique and consensus nomenclature for relevant concepts associated with this domain. Moreover, this ontology will serve as a compass for bone-setters and various users of this domain for intelligent decision-making during the process of administering care to patients, during the training of practitioners, and in the transmission of this traditional medicinal heritage.

Literature Review:-

The option of traditional treatment for musculoskeletal injuries is a discipline of the traditional medicine that has been subjected to several research works. Indeed, Abdoul WM and al. 2020, Loukou Kouamé and al. 2021, through their research on the frequency of patients admitted to trauma emergencies who have opted for traditional practices over treatment at a public referencial hospital, have highlighted the high cost of treatment, belief in the effectiveness of traditional treatment, religious or ethnic beliefs, and the slowness in patient care as fundamental factors influencing this medical choice. In order to minimize the numerous complications that occur during the management of patients who turn to this popular medicine, A.B. Omololu MD and al. 2008 propose to traditional healers, at the end of a training administered by orthodox orthopedic surgeons, an algorithm to aid in the effective management of open and closed fractures. Similarly, Ndubuisi Onu Onyemaechi and al. 2020, suggested the feasibility of formal training for Traditional Healers (THs) in Nigeria by orthopedic surgeons. In their view, this will not only ameliorate the efficiency of the care and treatment services offered by traditional bone-setters, but also foster greater collaboration between the two types of medicine.All these previous related studies are limited to the purely medical field and thus do not open windows into the domain of semantic web. This new salvation comes from the work of (Brou KM and al.2014), a renowned expert in the domain ontology in the field of traditional medicine in West Africa. He and his peers have highlighted the importance of knowledge sets in veterinary popular medicine while disregarding visual aspects. This gap was filled a few years later by (Appoh Kouame and al.2021) through their formal iconic and generic method of representing twenty-two (22) distinct medicinal plants and twenty-eight (28) recipes for traditional treatment of malaria in West Africa. However, all these published articles don't almost contribute to the implementation of an ontology in the world of Traditional Healers.

Methodological Approach to the Development of ontoFRACTURECARE:-

Multi-source Data Collection Methodology:-

To deeply conduct researches in this environment, we chose the socio-anthropological method as our investigative methodology. Indeed, this technique allows the respondent to have direct, sometimes intimate contact with families who are adherents of this cultural practice. It is in this context that we initially planned to visit twenty-six (26) Traditional bone-setters (TBS) all around several regional capitals of Côte d'Ivoire. Unfortunately, the law of silence and fear of the unknown prevailing in this environment thwarted our investigation. Thus, we were only able to meet five (05) professional TBS, aged between 29 and 83, residing in four (04) different locations in Côte d'Ivoire, namely: ADJAME, ABENGOUROU, GUIGLO, and SANKADIOKRO (sub-prefecture of Abengourou), from March to July 2020 (see Table 1 below). To overcome this impasse, we changed our approach. To do this, we conducted a survey on adult patients who were abandoning hospital care in the orthopedic-traumatology department of the Treichville University Hospital Center, covering the period from January 2015 to December 2022. From this second phase of the investigation, we obtained four hundred and two (402) physical patient records out of the one thousand four hundred and nine (4902) hospitalized patients who had interrupted their care.

Table 1:- Distribution of TBS having cooperate in 2020 by age and locality of residence.

Number	Name and Surname	Age	Date	Place of Residence	Duration of Interview	Years of Experience
1	KINDA Oumarou	29	2020.05.16	Abengourou	47 min	12 years (2008)
2	KINDA Issa	52	2020.05.20	Abengourou	21 min	18 years (2002)
3	TOPKA François	60	2020.06.14	Guiglo	19 min	27 years (1993)
4	KOURIBA ISSAKA	45	2020.06.25	Adjamé	11 min	22 years (1998)
5	INZA Sangaré	83	2020.07.16	Sankadiokro	15 min	44 years (1976)

Among this group, two hundred and one (201) patients or their relatives agreed to cooperate in this research until its completion, at various levels during the phone interviews. Thus, considering Table 2, it emerges from the previous figures that one hundred and fifty-five (155) patients received care from 73 TBS. These TBS, based on the same table, are spread across 07 West African countries. Ivory Coast stands out with thirty-seven (37) localities out of forty-three (43). From the weaknesses of the first phase of the survey, we categorized the TBS by attendance rate, then selected facilitators among the treated patients. They willingly agreed to accompany us to the first eight (08) TBS in Table 3.

Table 2:- Statistical table distributing by destination the patients who cooperated and left against medical advice from the University Hospital of Treichville from 2015 to 2022 in favor of the TBS.

Number of Patients treated by the TBS	155	155 out of a total of 201
Number of deceased patients	05	05 out of a total of 155
Number of traditional healers with undefined locality	12	12 out of a total of 73
Number of localities in Ivory Coast where the TBS practice	37	37 with a total of 120 patients
Number of other countries in the sub-region that received patients	06	(Benin-Niger-Mali-Togo-Nigeria-Burkina Faso) for a total of 18 patients

Table 3:- Ranking of the first eight (08) cooperative TBS in 2023 receiving the most deserting patients.

Number	Name and Surname	Age	Locality	Neighborhood	Total number of patients received
1	KOURIBA Issaka	48	Adjamé	Bramakoté	18
2	KACOU Binger	38	Logbakro	-	07
3	Vieux Amidou	61	Yopougon	Port-bouet 2	06
4	Papa Konan	57	Bondoukou	Attrame	06
5	Goman Issa	51	Aboisso	koffikro	05
6	Abou	49	Grand-Bassam	Phare	04
7	Hamidou	55	Agboville	Grand Moulin	02
8	Kinda Issa	32	Abengourou	HKB	02

Development Methodology:-

An information ontology is a formal and standardized technique for representing knowledge within a domain in a coherent and unified manner to assist in informed decision-making by experts and users in that environment (Serge Aman and al. 2023). By domain ontology, we mean the description and representation of concepts and the relationships between these concepts within the specific domain, as they are used and manipulated by professionals or practitioners in this sector of human activities (Appoh Kouamé and al. 2018). The methodology for designing this ontology remains a difficult and complex task that requires time (Mohammad K and al. 2023). Hence the existence and lack of a single, correct approach to the development process of this conceptual graph. Additionally, the modalities vary depending on the subjects and corresponding projects (Xianming Tang and al. 2022), leading to multiple schools of thought. In order to create a consensus on the subject, (Shaimaa Hariry and al. 2023) have developed the ON-ODM method (Ontology Development Methodology). This method relies on twenty (20) inclusion criteria to compare twenty (20) proposed methodologies from 2018 to 2023. It emerges that ON-ODM is domain-independent while demonstrating its ability to cover nearly all crucial activities involved in the development and conceptualization of all kinds of ontologies. However, the field in which our ontology is implemented makes the automatic application of ON-ODM difficult. Thus, it becomes undeniable in the approach that we have developed to adapt a section of ON-ODM and other existing methods to align with our research domain, as illustrated in Figure 1.

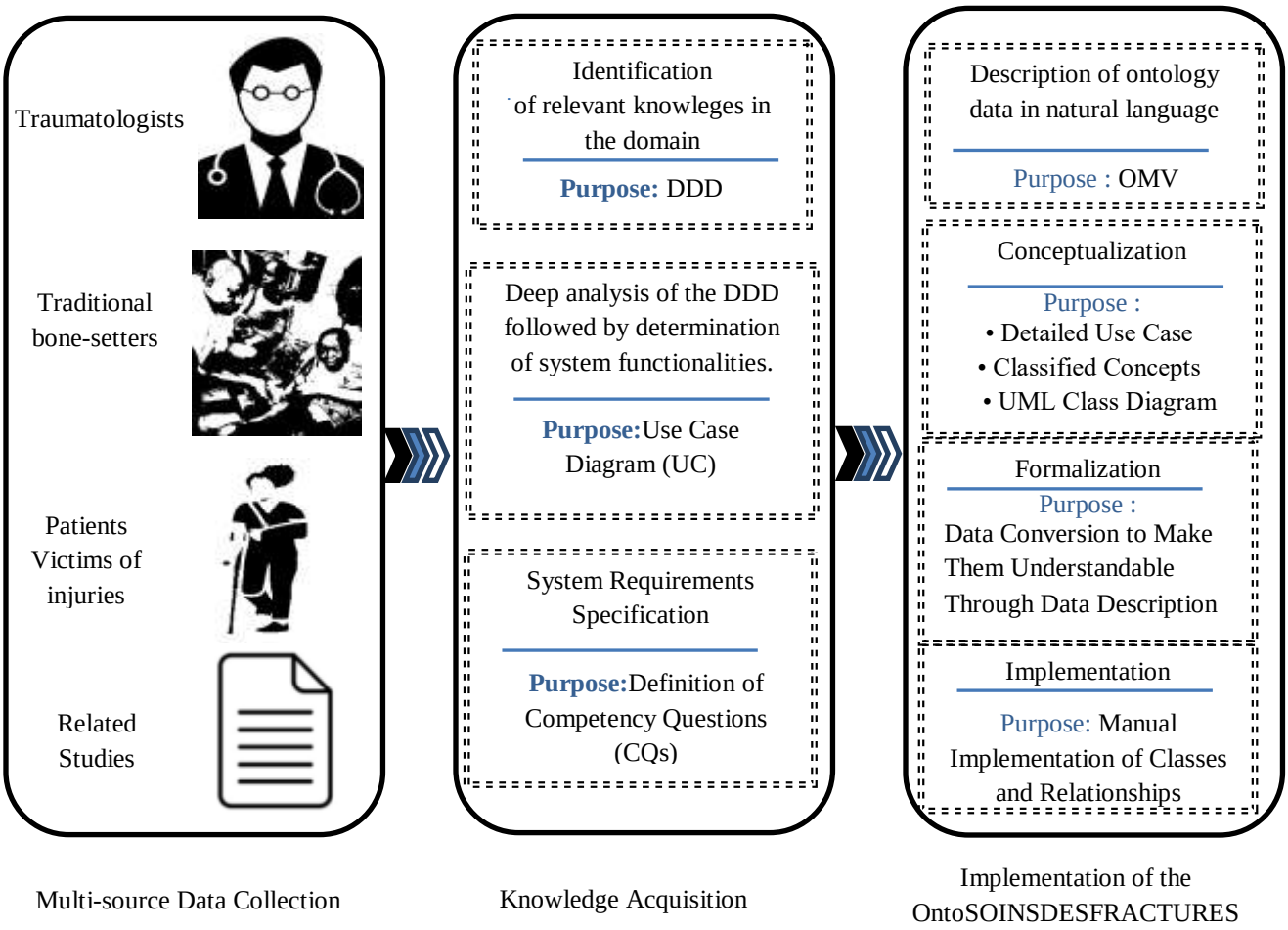

Figure 1:- Adapted ON-ODM Methodology Proposal.

Knowledge Acquisition Phase:-
This phase revolves around three different steps: identification, comprehensive analysis of existing data, and domain specification.

- **Step 1:**-Identification Phase
The main purpose of this section is to collect and document the final list of constraints that OntoSOINSFRACTURES must address in the Domain Description Document (DDD) (Shaimaa Hariry and al. 2023). The importance of the DDD lies in its ability to describe domain specifications and meet user requirements that illustrate the final expectations of the clients for whom the ontology is created. To achieve this, filtering and selecting relevant terms that will later serve as ontology classes is performed (Jamal Asim and al. 2024). Thus, we conducted phone and in-person interviews with some TBS experts and practicing traumatologists at the Treichville University Hospital and the Abengourou Regional Hospital. Additionally, narratives from patients and their relatives were taken into account with utmost care. Furthermore, online resources on relevant previous studies regarding the activities of TBS and semi-automatic ontology construction were consulted. All these activities, based on the needs of the intended ontology users, allowed us to inventory, identify, extract, and highlight in the DDD concepts derived from technical vocabularies, literature, protocols, and data circulating in this field. These concepts, placed at the top of the concept pyramid, consist of the most frequently used concepts in the world of traditional medicine. Table 4 illustrates the proposed DDD.

Table 4:- The proposed DDD applied to the field of TBS.

Domain : Practice of traditional osteosynthesis in Africa
Description : Traditional osteosynthesis refers to the practices, methods, knowledge, and beliefs in health

often without scientific basis used by the local community to prevent, diagnose, and treat musculoskeletal injuries.

Major objectives of the ontology:

- Reduce heterogeneity regarding medical terms and concepts circulating in the world of traditional medicine.
- Diagnose and treat diseases or preserve the health of patients affected by fracture injuries and others without any form of discrimination.
- Minimize complications during the patient care process.
- Develop community health and well-being.
- Enable social and economic development.

……..

Scope:

Practice of traditional osteosynthesis by TBS residing in Ivory Coast.

User requirements:

Requirement 1: Diagnose the nature and type of injury

Roles: Traditional bone-setters, patients, nurses, radiologists, and traumatologists.

Description: The user should be able to exploit the ontology to determine the origin of the ailment, the body part involved in the impact, the type of injury, and its severity level. They should also be familiar with the technical terms describing the world of TBS in a diagnostic phase of the nature and type of injury.

Requirement 2: Treatment of the injury

Roles: Traditional bone-setters, patients, nurses, radiologists, and traumatologists.

Description: The user should be able to rely on the ontology to classify the type of injury according to the competencies of the TBS or Traumatologist. They should be able to understand the care protocol for each type of injury by TBS as well as remedies and prohibitions. The user should also be familiar with technical terms related to the world of TBS during patient care.

Resources: Related studies on musculoskeletal injuries and on the design of domain ontologies focused on traditional medicine in Africa for medical terminologies, interviews with experts in modern and traditional traumatology.

Step 2:-Analysis Phase

The Domain Driven Design (DDD) is the result of extracting key information based on the needs of future users of the ontology. At this stage, after a deep analysis of constraints, it is necessary to refine the DDD to rid it of redundancies and unattainable constraints. The goal of this analysis phase is to establish the functional specifications of the system, i.e., the list of system functionalities. To better address this concern, it is appropriate to answer the three (0 3) following questions. Firstly, it involves defining the various main tasks performed by users to interact with the system and its interface. These are called use cases (UC), which form the basis of the TBS needs analysis. Next, we define the (human or other physical computer systems) which will use and interact with the system. This is referred to determining the system's environment. Finally, we define the boundaries of the knowledge system, namely, what is within the system's capabilities and what lies beyond its scope, i.e., its limits. To conduct this reflection, the needs identified in the DDD obtained from this normalization process are then converted into a set of distinct functions of the ontology users' system. At this stage, after a deep analysis of constraints, it is appropriate to refine them into UML diagrams. The advantage of these UML diagrams is that they are easy to understand. Moreover, there is a variety of diagrams available, including the one dedicated to use cases. Its mission is to highlight the different roles of the various parties involved. The same applies to use cases.Once these use case diagrams are schematized, it is important to detail the scenarios behind each use case through structured text. Thus, the aforementioned activity has led us to articulate our modeling work around two (02) main use cases (UC), a fragment of which is represented in Figure 2.

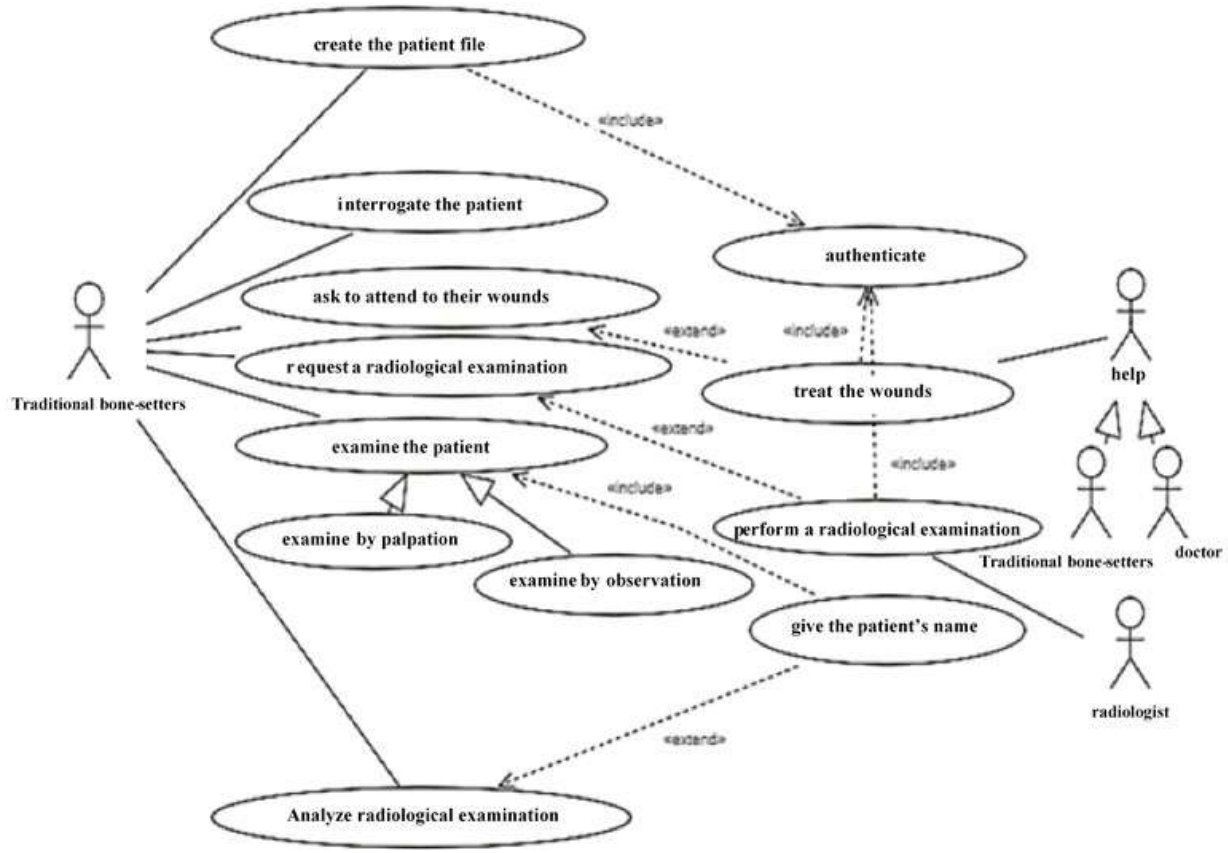

Figure 2:- Fragment of the use case diagram related to lesion diagnosis.

Step 3:-Specification Phase

This phase of specifying the functional requirements of the ontology remains one of the most utilized sub-parts of the knowledge acquisition phase. According to (Shaimaa Hariry and al. 2023), it involves converting the list of cleaned constraints into a definitive set of competency questions (CQ). Once adopted, these CQ are classified into two (02) major groups. These are:

1. Diagnosis;
2. Treatment.

An excerpt of some CQs from the TBS environment is provided in Table 5.

Table 5:-Competency Questions for the Practice of Traditional Osteosynthesis by TBS Residing in Ivory Coast.

CQ1 – 1 : What are the targeted objectives by TBS during the diagnostic process?
CQ1 – 2 : What technical terms do TBS use to make a diagnosis?
CQ1 – 3 : What are the means used by TBS for making a diagnosis?
CQ1 – 4: What are the different steps followed by TBS to make a diagnosis?
CQ1 – 5 : What are the different types of lesions commonly encountered by TBS during the diagnostic process?
CQ1 – 6 : What information is available about the practice of TBS ?
CQ2 – 1 : What objectives are aimed at by TBS during patient care administration?
CQ2-– 2 : What technical terms do TBS use in diagnostic situations?
CQ2 – 3 : What technical terms do TBS use in diagnostic situations?
CQ2 – 4 : At what point do TBS refer patients to modern medicine?
CQ2 – 5 : What are the different steps involved in managing lesions by TBS ?
CQ2 – 6 : What are the guidelines and restrictions that patients must adhere to?
CQ3 – 1 : What are the different types of remedies used by TBS?
CQ3 – 2 : Who is authorized to prepare TBS remedies?
CQ3 – 3 : What are the major categories of remedies that exist among TBS ?

We have just achieved the specific objectives assigned to the three (03) important sections of the knowledge acquisition phase, which will allow us to establish the foundations of our knowledge system. These are first the DDD, then the use case diagram, and finally the CQ.

The Development Phase of ontoFRACTURECARE:-

In its development phase, ontoFRACTURECARE follows the approach of ON-ODM. These share common characteristics with the most frequently used methods. These include the skeletal method, the TOVE method, the IDEF5 method, the KACTUS method, the SENSUS method, and the METHONTOLOGY method (Xianmingand al. 2022, Appoh Kouame and al.2018). These methods are largely based on four (04) important parts: Specification, Conceptualization, Formalization, and Implementation. Each of these sub-parts will be deeply discussed below.

Specifications :-

According to the work of Hartmann et al. 2005, the objective in this first section is to design the Ontology Metadata Vocabulary (OMV). Once designed, the OMV is a textual document accessible to all, available on the internet, which contains the description of ontology data in natural language (Shaimaa Haridy and al. 2023). Table 6 below explains the OMV of the ontology in the domain of medical practices of TBS.

Table 6:- OMV of the ontology in the domain of medical practices of TBS.

Metadata Vocabulary of the ontology of medical practices of TBS.	
Ontology Name :	Ontology of Care for Fractures (ontoFRACTURECARE)
Location :	Virtual University of Ivory Coast., West Africa
Domain (Organization) :	Science and technology
Specialty:	Computer Science - Big Data Analytics
Licence Model :	Academic Research
Ontological Domain :	Traditional Medicine in West Africa
Ontology sector :	Practice of Osteosynthesis by Resident TBS in Côte d'Ivoire
Ontology Type :	Domain Ontology
Ontological Engineering Tool :	ASTA UML and Protégé Editor
Ontology language :	OWL
Ontology syntax :	Rdf xml Syntaxe
Ontological task:	ontoFRACTURECARE represents all concepts in the domain of TBS practice along with their semantic descriptions. This will assist TBS and all users of this domain in sharing a common vocabulary and a consensual semantic meaning during the diagnostic and treatment process of a patient suffering from musculoskeletal injury by traditional African bone setters.
Ontological Engineering Methodology :	ON-ODM methodology adapted for ontological construction of the domain.
Knowledge Source :	Non-ontological resources: (expert domain knowledge from 'Traditional bone setters and traumatologists', domain user knowledge from 'Patients and patient's relatives', domain documentation, online resources such as...) Ontological resources: (existing ontologies)

Conceptualization:-

Traditional treatment of musculoskeletal injuries represents the core activity of TBS. The objective of ontoFRACTURECARE is to collect and structure relevant knowledge in the domain. Therefore, it must provide information sharing services among experts in this traditional medical practice. This will ultimately lead to intelligent decision-making for patient care, during apprenticeship, and in the process of transmitting this heritage. Achieving these critical objectives of our study involves the conceptualization phase. This phase involves searching for, highlighting, and refining key concepts, concept attributes, and relationships between these concepts, which will ultimately form the framework of our ontology (Mohammad K and al. 2023). This step becomes relevant when other knowledge acquisition sources are explored and contributed. This was the case with ontoMEDTRAD, developed by

Appoh Kouamé and al. 2021, an icon-based language initiated to clearly identify twenty-two (22) concepts of medicinal plants, some of which fall within the scope of ontoFRACTURECARE. Furthermore, to better achieve the

ontology's objectives, activities within the domain are subdivided into two (02) dominant use cases: diagnosing the type of injury suffered by the patient (UC1) and administering necessary treatment to monitor the patient during the treatment period (UC2). In other words, a use case is the accomplishment of the goal that the user has set at the end of all interactions with the system. To better achieve this mission, a textual description of use cases is created through a usage scenario. This scenario is a sequence of interactions between one or more users and the system. It allows the user to perform a series of simple or complex tasks hidden behind each use case. In Table 7, the detailed use case of diagnosing a patient is executed. In this table, a structured natural language description of all the steps that enable the TBS to make a probable diagnosis of the nature and type of a patient's traumatic injury is provided. Only actions between the system and the TBS are taken into account.

Table 7:- Detailed Use Case for Diagnosing the Nature and Type of Injuries in a Patient.

Name: Diagnose Actors: Traditional bone setter, followers Input data: Patient present in a traditional bone treatment center The use case begins when the bone setter clicks on the "diagnose" button.
Main scenario: 1. The system prompts the bone setter to enter their username and password. 2. The bone setter enters their correct username password and validates. 3. The system prompts to enter the patient’s ID from the list of IDs or to enter a new one if it is a new patient. 4. The bone setter enters the patient’s ID. 5. The system prompts the bone setter to enter inofrmation about the circumstances in which the patient’s injury occured. 6. The bone setter enters the patient’s medical data. 7. The system displays information aboit the patient’s medical record and indicates whether they can treat the patient or release them for treatment elsewhere. 8. The system prompts the bone setter to enter the patient's information after they have completed their visual and physical examinations. 9. The bone setter enters data on the patient's clinical examination. 10. The system asks, if possible, the bone setter to enter the conclusion of the interpretation of the patient's radiological analysis after the bone setter has performed a visual and physical examination of the patient**.** 11. The bone setter enters, if possible, data on the patient's paraclinical examination. 12. The system prompts the bone setter to enter the probable diagnosis of the patient**.** 13. the bone setter enters the type and nature of the patient's injury. 14. The system prints a consultation sheet that mentions all the details related to the injury as well as the probable diagnosis determined by the bone setter.

Based on the use case diagram and the description attached to these diagrams, a classification system of the binary relationships existing between the different concepts is adopted, as illustrated in figure 3. The aim is to establish, on the basis of consensus and representativeness, a hierarchical organization of the concepts of the environment at different levels with different depths.

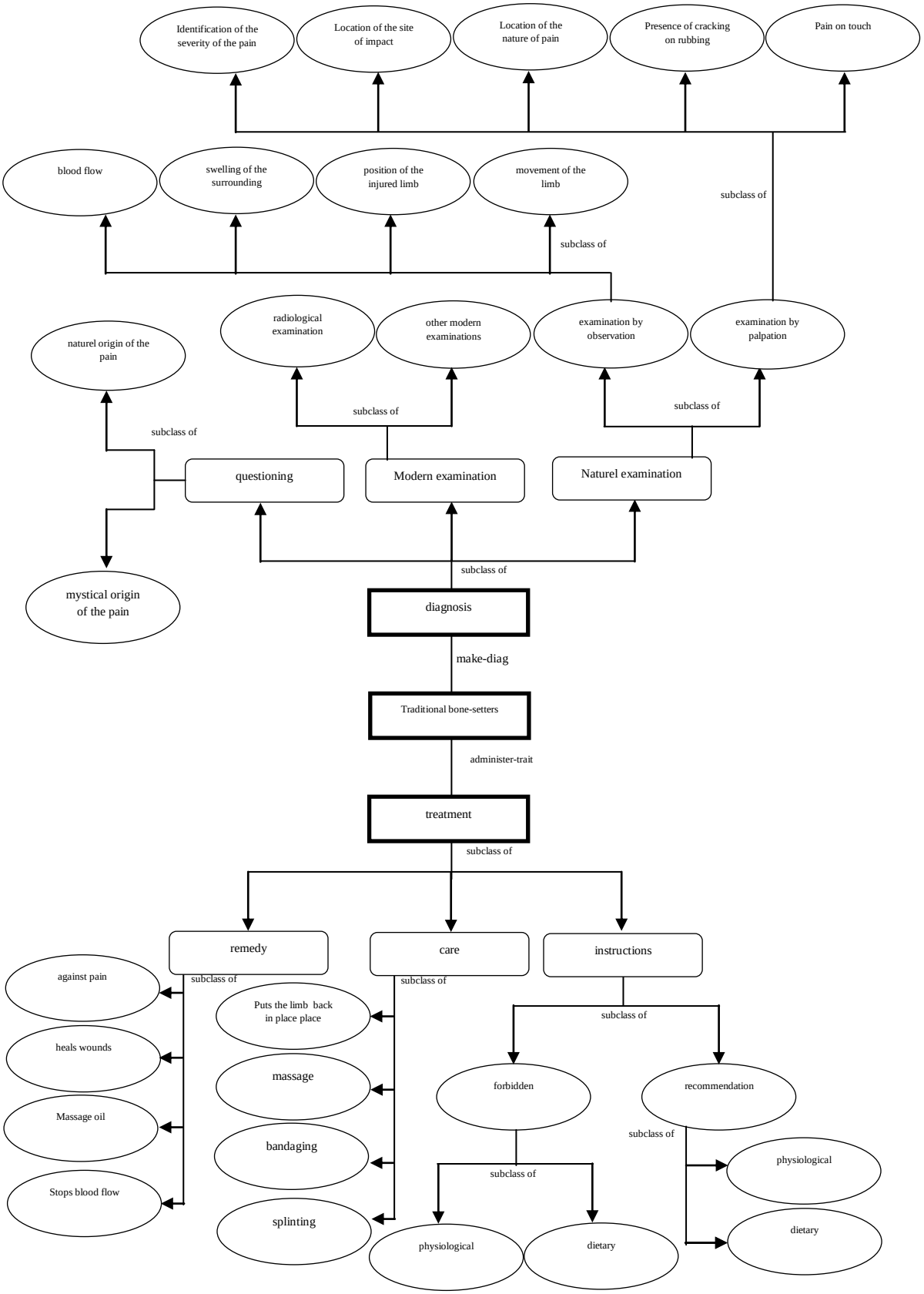

Figure 3:- Fragment de classification des concepts majeurs de ontoFRACTURECARE.

Based on the knowledge acquired above, the traditional bonesetter is able to establish the following relationships during the diagnostic process:

1. Creat the patient's medical record after authentication ;
2. Interview the patient to find out the cause of his or her illness;
3. Ask the victim to treat his or her wounds either in hospital or on site;
4. Examine the patient (by palpation and observation);
5. Ask the patient to have some X-Ray tests at the hospital, and bring back the results;
6. Analyze the results of the radiologist's examination;
7. Make a diagnosis based on the findings of previous examinations.

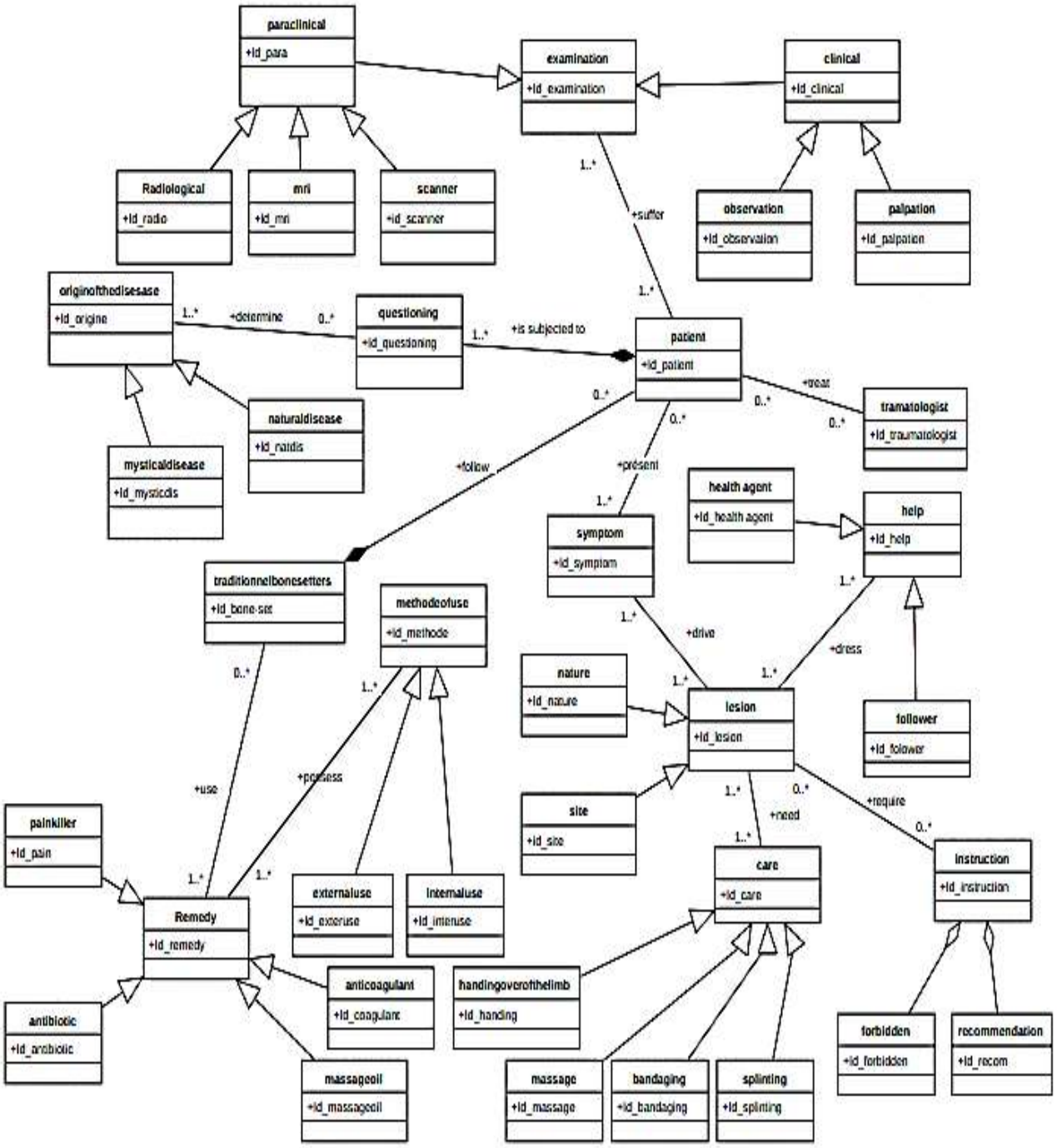

Figure 4:- Fragmant of the ontoFRACTURECARE major class diagram.

In addition, the TBS during the restoration of musculoskeletal injuries develops the following relationships:

1. refer the patient to the appropriate modern health structures in case of incapacity;
2. make a libation or incantation before the start of any treatment (depending on whether or not the patient has paid for spirit colas);
3. give traditional painkillers if possible;
4. apply and gently massage the site of injury;
5. return the limb to its original anatomical position;
6. bandage limb in case of dislocation or fracture;
7. apply traditional splints (bamboo, raffia or other) in the case of fractures;
8. give advice and instructions to be followed by the patient throughout treatment;
9. give the patient an appointment for the next treatment session, even if the lesion is not completely healed.

Figure 4 illustrates this conceptual model.

Formalization:-

Formalization is the next stage after conceptualization. The objective guiding this phase is to transform the previous conceptual model from a modeling language initially understandable by humans, into a form that can be interpreted by computer programs. This involves firstly translating existing data using the description logic, and secondly integrating them seamlessly into the ontolgiques format (Serge Aman and al. 2023). Clearly, this involves firstly defining the concepts and roles used by the constructors provided by the description logics (TBOX construction) and secondly, the construction of ABOX, i.e. the description of facts using the best-known assertional ontology representation language, OWL (Web Ontology Language), to the detriment of RDF (Resource Description Framework) and SPARQL (Protocol and RDF Query Language). Applying the previous tasks, we were able to extract over forty-seven (47) major classes and subclasses for the ontoFRACTURECARE ontology.

Implementation:-

The task assigned to this stage is to manually implement our ontology using a range of appropriate editors. After a comparative study, the tool we selected won out over the Apollo, Swoop and IsaViz editors, because it is free and does not present any particular methodology. What's more, it is compatible with almost all ontology development methodologies, from conceptualization to maintenance, formalization and implementation (Appo Kouamé and al. 2021). Once the classes have been created, the properties linking them are defined. Instances of each class are then created. Once the various elements required to set up our ontology have been created, we move on to its construction. Figure 5 below shows the Ontology of the African TBS care system named ontoFRACTURECARE.

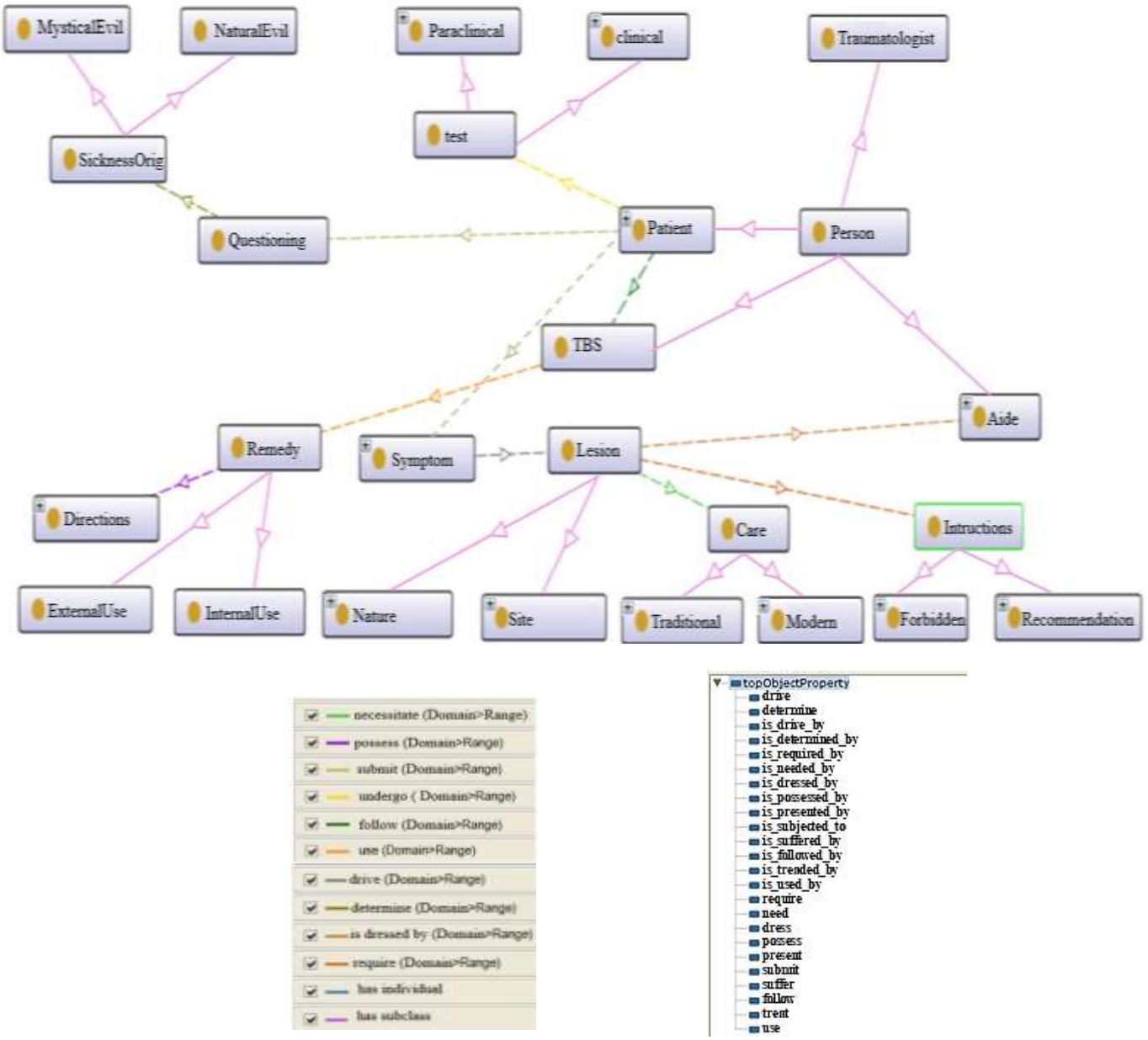

Figure 5:- Fragment of the major classes and relations of ontoFRACTURECARE.

Discussion:-

The results of this study are of particular interest in the research context. Indeed, the data obtained, analyzed and prioritized in this research show that the care of musculoskeletal injuries and lesions occupies an important place in meeting the health needs of local communities in Côte d'Ivoire. The first aim is to make data from this traditional practice available, but also to boost research in the field of traumatology. A good knowledge of the resources in this field enables better planning of operations. The rules used in ontological design help to improve operating parameters and the monitoring and control of practices. They also help to ensure the sustainability, growth and optimization of crimping practices by traditional reworkers. The study will also ensure the protection of local medicinal plants and the deliberate propagation of this traditional knowledge among the younger generations living in the country's towns and remote areas.

Conclusion:-

In this work, we have built a fractal domain ontology for TBS. This ontology presents the care execution pathway. A field survey of twelve (12) specialists, including eight (08) traditional bonesetters and four (04) professional traumatologists, yielded 201 data. These data were grouped into concepts, sub-concepts and instances. The ON-ODM method was then adapted and used for modeling. For implementation, Protégé software was used to pre-process domain knowledge. Testing with SPARQL has shown that the ontology designed is operational and machine-readable.

Perspectives:-

The ontology of the traditional fracture care domain is built, but remains limited. The first area of future research will be to collect more data and then add new concepts to the TBox terminology part.Next, complete the TBox and ABox of the formal ontology initially built by the G-Box. The latter remains a graphical part comprising the icons and their (more advanced) framework.And finally, we'll be deploying our ontology in a semantic Wiki platform.We should also plan to group our various works on the automatic tradition of our languages commonly spoken by TBS so that they can exchange from cell phones in order to put these works forward to give something exploitable and consensual by our traumatologists. It would also be undeniable to propose a method of modeling fundamental knowledge for the transmission of the traditional medical heritage resulting from the practice of TBS. This model based on a care protocol will be subject to prior validation by all the experts involved in the field, i.e. TBS and traumatologists.

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