International e-learning in new technologies for diagnosis and treatment of foot pathologies - PODIATRAIN

R. Portilla[1], C. Solves[1], C. Soriano[1], E. Navarro[1], J. Torralba[2], C. Formosa[3], A. Gatt[3], A. Kiviaho-Tiippana[4]

[1] Instituto de Biomecánica de Valencia

[2] Universidad Católica de Valencia

[3] University of Malta

[4] Mikkelin Ammatikorkeakoulu

***Abstract*—**As European society ages, healthcare and related social services are becoming increasingly important. This growing demand is creating unprecedented demands of skilled professionals on health and social care systems. In consequence, states are facing skills shortages in healthcare disciplines such as podiatry. Although podiatry has undertaken a significant transformation from the traditional practice to the integration and use of the latest technologies for user assessment, resources are needed to transform foot health care into a modern clinical speciality. In addition, stimulating and maintaining an adequate level of interest in podiatry will be of vital importance to contribute to its professionals' progression and reward.

In this context arises PODIATRAIN project, with the aim to contribute to open pathways to the modernisation of the podiatry sector. PODIATRAIN - *Open online course in new technologies for diagnosis and treatment of foot pathologies* - is an international project which aim is to create a European high educational framework to homogenize and improve knowledge in advanced techniques and treatments as well as bring to bear the newest technologies for user assessment, covering the gap between foot care professionals and the continuous advances in the sector. PODIATRAIN will generate an e-learning tool available in two languages (English and Spanish).

This article presents the first project research outcomes, focused on three aspects: 1) training needs of podiatrists in different European countries, 2) the conceptual structure of the e-learning course, 3) the definition of the tools and methods for knowledge assessment, according to users' expectations.

The methodology followed was based on the development of expert panels and self-reported surveys. The major findings of the study were the demanded subjects and contents for the course, the preferred format and the accreditation required.

***Keywords*—**international e-learning, podiatrists, foot, PODIATRAIN

I. INTRODUCTION

PODIATRAIN arises to generate a learning offer addressed to podiatrists and foot health professionals to complement the learning outcomes of current formal high educational programmes with training in new technologies for diagnosis and treatment of patients. The diversity in formal education programmes across countries leads to a consequent heterogeneity of podiatry professionals [1], but the need of gaining knowledge in new technologies for patient assessment and diagnosis is a common issue throughout Europe. The analysis of current education programmes and the associated learning outcomes as well as the professionals' needs has allowed detecting some training gaps:

- Podiatrists learn to diagnose and treat patients with wide range of pathologies. But to provide accurate diagnosis and solution, they need extended and in-depth knowledge of biomechanics inherent to specific patient´ profiles. They also require skills to perform biomechanical assessment using latest technological devices. In occasions, the treatment fails not because of medical issues, but because of the lack of in-depth biomechanical knowledge. Often this knowledge is not discussed with enough depth during medical training [2].

- Many lower limb disorders involve the prescription of customized orthoses, requiring accurate acquisition of patient foot shape. Traditional methods are evolving to 3D scanning technologies that allow acquiring foot shape at different loading phases. This leads to improvements in comfort and functionality of the orthoses [3]. In the design and manufacture fields, computer aided design and manufacturing (CAD/CM) are emerging techniques that have proven efficacy and excellent results [4]. The increasing affordability of these tools offers significant savings over traditional techniques in terms of customisation, cost and delivery time [5].

- An optimum treatment requires to know the wide range of biomechanical properties of different materials available in the market in order the orthesis attain the desired

performance objectives. The available scientific literature providing comprehensive information about properties, new materials and criteria for the selection of materials is limited. In most cases, choice is subjectively determined based on the expertise of the practitioner [6].

Taking this as background, PODIATRAIN - Open online course in new technologies for diagnosis and treatment of foot pathologies – was formulated as an international training action to counteract detected lacks. The project and program logos are presented in the Fig. 1.

Fig. 1 Logos of PODIATRAIN project and funding program

PODIATRAIN arises to generate a learning offer addressed to podiatrists and foot health professionals to complement the learning outcomes of current high educational programmes with training in new technologies for diagnoses and treatment of patients.

This article presents the first PODIATRAIN research outcomes focused on three aspects: 1) training needs of podiatrists in different European countries, 2) the conceptual structure of the e-learning course, 3) the definition of the tools and methods for knowledge assessment, , according to users' expectations.

II. METHODOLOGY

The methodology followed was based on a two-fold strategy. Firstly, tackling the research from a general perspective, developing expert panel sessions to draw the current outlook regarding training in podiatry. And secondly, from a more individual perspective, developing self-reported questionnaires focused on analysing the individual demands of podiatry professionals regarding: 1) training needs, 2) evaluation and self-assessment preferences and 3) demanded format for the course.

The aim of the expert panel sessions was to identify the real problems of the podiatrists, as well as previous experiences in the field of podiatry education, and then to define the scope, structure and formal issues of PODIATRAIN course, including duration, expected learning outcomes, etc. Three expert panel sessions were organised in Malta, Finland and Spain. Each session was conducted according to one scenario including three substantial points: 1) analysis of the current courses in new technologies for diagnosis and treatment of foot pathologies (if any) with identification of strengths and weaknesses of them; 2) analysis of the areas of knowledge required for developing the course; 3) identification of requirements for adequate training material. The outcomes of each session were gathered and aggregated in order to formulate the structure and scope of questionnaires for podiatrists as well as to define universal requirements for e-learning course.

Self-reported questionnaires were used in order to obtain detailed and quantitative data provided by potential users: podiatrists and students. A European survey was conducted using an online platform. Particularly the aim of the survey was to get knowledge about preferences regarding e-learning course. The questionnaire structure included 5 sections: 1) personal data; 2) experience in podiatry; 3) course features; 4) training expectations and preferences; 5) training contents needs.

One of the most important elements of the course is the verification of the knowledge acquired (evaluation and self-assessment) by students. The forms and methods of such verification should be adjusted to training content and should verify the students' knowledge in reliable way. On the other hand, the assessment methods should be attractive and encourage potential students to join e-training. Hence, one of the aims of the survey was to get knowledge about preferences of people on ways and techniques of evaluation and self-assessment. These preferences will be the patterns for creating the evaluation methodology of PODIATRAIN course. In this sense, the questionnaire included questions regarding: i) relevance of evaluations, ii) preferences for global and periodic knowledge verification, iii) preferences for the final knowledge verification (i.e. exam in time restriction), iv) impact on the attractiveness of the course and on the decision about joining e-training.

The questionnaire was performed among respondents with following characteristics: 1) respondents were active people when it comes to gaining knowledge; 2) they were also participants of different kind of degrees' studies; 3) they were professionally active or prepared for professionally working; 4) they possessed knowledge about usability of e-learning platform. All questionnaires outcomes were processed with the use of descriptive statistics methods.

III. RESULTS AND DISCUSSION

A. Expert panel sessions results

Experts who took part in sessions were considering new technologies for diagnosis and treatment of foot pathologies from different perspectives, contributing with different experiences and views on podiatrist working conditions. Hence, it was obtained comprehensive information on the needs, interests and concerns when it comes to new technologies for the assessment of the patients. As a result, a preliminary course structure was prepared and included into questionnaires for verification.

Particularly, this initially proposed structure is a compromise between experts. The main topics are the following:

- Biomechanics of pathologic foot and ankle problems. Introduction to existing biomechanical theories.
- Technologies for the biomechanical assessment of the patient.
- New trends in Podiatry.
- Biomechanical and functional properties of the materials used in manufacturing inserts and foot orthoses.
- New technologies in the design and manufacturing of therapeutic solutions.
- Applying biomechanics into specific population groups.

This initial structure was included into questionnaires on training needs as a proposition of training content for verification.

B. Questionnaires on training needs

In total, 109 questionnaires were gathered among professionals from different European countries, 62% of them were women. These results obtained, are expected to be shown at European level, do not differ between the countries that have participated in the study.

The professional profiles of the respondents are presented in the Fig. 2.

Fig. 2 Professional profile

In the Fig. 3 it is presented the distribution of respondents regarding years of experience in their profession. The majority of respondents have indicated more than 5 years of experience.

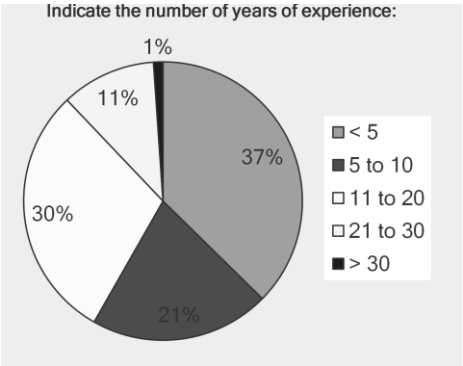

Fig. 3 Years of respondents' experience

Less than half of the participants in the survey state to have suitable or very suitable training regarding new technologies for the diagnosis and treatment of foot pathologies at the time of joining their first job, as it is showed in the Fig. 4.

Fig. 4 Have podiatrists received any training related to new technologies of diagnosis and treatment of foot pathologies?

The main topic proposed by PODIATRAIN initiative corresponds to a knowledge area assessed as suitable or very suitable by 74% of the participants in the survey (see Figure 5).

Fig. 5 Podiatrists' opinion about appropriateness of proposed training course

The results obtained from the survey show that, although an online course is an appropriate format for imparting the proposed course, complementary actions are needed to support learning of practical skills. In this sense, most of the respondents highlight that training contents must be focused on practice and increase of the professional skills in order to redound in improved and more efficient working activities. In this sense, the use of information technologies like computer simulations, video lessons or interactive games are formats suggested to incorporate practical aspects into the e-learning process.

Regarding the preferred duration of the course, the opinion of the participants in the survey indicate that the course should have a maximum duration of 60 hours including both theoretical and practical contents (see Figure 6).

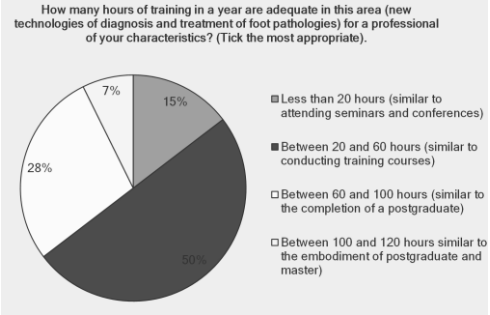

Fig. 6 Preferred duration of the e-learning course

The participants in the survey evaluated the learning topics initially proposed according to their relevance for the development of the professional activity (Figure 7) and their interest in receiving training about each topic (Figure 8). Most of the proposed topics are considered as essential for the professional activity by more than 50% of the participants. The only exception is the topic *New trends in podiatry*.

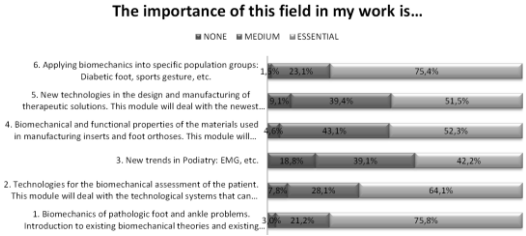

Fig. 7 Relevance of the topics for the professional activity

The topics most demanded are those related to biomechanical learning followed by the knowledge in technologies for the biomechanical assessment.

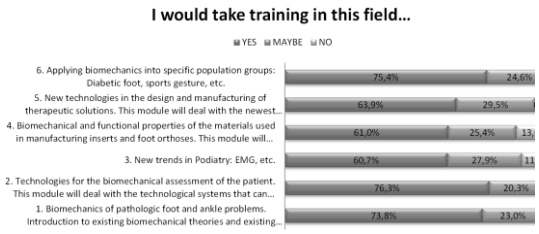

Fig. 8 Importance of contents

From the results provided by the survey, the learning contents of PODIATRAIN course have been configured according to the following index: 1. Functional anatomy and complete body assessment. 2. Biomechanics. 3. Basic training in technology. 4. Technology with diagnostic application: method of validation. 5. Technology with therapeutic application/therapeutic options. 6. Image diagnosis. 7. Data analysis. 7. Materials. 8. New trends. 9. New technologies in the design and manufacturing. 10. Application of biomechanics in special groups.

IV. CONCLUSION

Training in new technologies for diagnosis and treatment of foot pathologies is a topic generally not included into the educational programs of most of the European universities. Therefore, professionals in foot health care, mainly podiatrists, demand training in this field.

The research findings obtained by the expert panel sessions and surveys have allowed defining an index of contents agreed with a representative sample of European professionals in the field of foot health care.

PODIATRAIN project means an opportunity for developing a global and international e-learning course on new technologies for diagnosis and treatment of foot pathologies.

Acknowledgments. This study was funded through the project 2016-1-ES01-KA203-024997 by European Commission ERASMUS+, Call 2016 KA2 – Cooperation and Innovation for Good Practices.

REFERENCES

[1] International Model of Podiatric Practice. FIP International Academy of Podiatric Educators, Annual General Meeting in Amsterdam April 2010.

[2] Boulton et al. (2006). The foot in diabetes. John Wiley & Sons

[3] Telfer et al. (2010). The use of 3D surface scanning for the measurement and assessment of the human foot. J Foot Ankle Res, 3, 19

[4] Schrank et al. (2013). Assessment of a virtual functional prototyping process for the rapid manufacture of passive-dynamic anklefoot orthoses. Journal of biomechanical engineering, 135(10), 101011

[5] Payne (2007). Cost benefit comparison of plaster casts and optical scans of the foot for the manufacture of foot orthoses. Australas J Podiatric Med, 41, 29-31

[6] Lo et al. (2014). New methods for evaluating physical and thermal comfort properties of orthotic materials used in insoles for patients with diabetes. Journal of rehabilitation research and development, 51(2), 311-324