

# Development of interprofessional educational module for understanding the musculoskeletal basis of sports injury

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## ABSTRACT

**Context:** Interprofessional education (IPE) is crucial in promoting a better understanding of collaborative practices within the healthcare system. Unfortunately, healthcare professionals are still working in isolation. To address this issue, a study was conducted to develop a module-based teaching and learning activity focusing on sports injuries and to promote IPE. **Aims:** The aim of the study was to develop, implement, and evaluate an IPE module. **Settings and Design:** An educational mixed-method study was conducted on 25 facilitators and 108 students. **Methods, Materials and Statistical Analysis:** The facilitators were interviewed for an assessment of the need for the IPE module. Qualitative analysis was done on the interview data. An interprofessional team was created to develop the sports injury prevention module (SIPM). The SIPM consisting of 11 objectives was developed and validated by experts. After the implementation of SIPM students' performance was analysed with the help of pre and post-tests. The perception of students and facilitators about IP SIPM were recorded with the help of questionnaires. **Results:** Need assessment data showed that the facilitators were not very familiar with the concept of IPE. There was a significant increase in students' performance with a  $P$  value  $\leq 0.05$  after learning with SIPM. Both facilitators and students agreed that module-based IPE increases students' attentiveness and learning. **Conclusions:** For effective interprofessional educational collaboration for training students of the healthcare profession, there is a need for an interprofessional educational module. SIPM can enhance the learning of musculoskeletal anatomy and create awareness about sports injuries among students.

**Keywords:** Interprofessional education, musculoskeletal anatomy, patellofemoral pain syndrome, sports injuries

## Introduction

Awareness of predisposing anatomical factors that can lead to sports injuries is important for clinicians. It helps them develop specific rehabilitation programs for these injury cases.<sup>[1]</sup> Kuntz

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A identified modifiable risk factors for non-contact anterior cruciate ligament injury among soccer and basketball athletes.<sup>[2]</sup>

At present, there is literature available on sports injuries, but articles on interprofessional educational modules related to sports injuries are few. The students have their engagements in sports and physical activities, which are also mandated by the introduction of physical activities by national medical commission(earlier MCI) NMC.<sup>[3]</sup> The present study has used this as an opportunity to develop and introduce the sports injury

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prevention module (SIPM) for making the teaching and learning of anatomy interesting and clinically relevant for students. As the lower extremity is a common site to get affected during sports activity, the musculoskeletal anatomy of this area was selected for the development of an interprofessional sports injury module. The students can learn about the musculoskeletal basis of sports injury and at the same time understand basic dos and don'ts to reduce the risk of common preventable injuries to the lower extremity.

The World Health Organisation (WHO) Framework for Action on IPE and Collaborative Practice emphasised upon incorporation of IP education in health professional curricula to create a better healthcare force.<sup>[4]</sup>

Thistlethwaite, J.E. recommended the incorporation of interprofessional education (IPE) in the basic science curriculum. He stressed upon incorporation of interactive theory and practical sessions. This study also provides examples of interprofessional education in anatomy with the incorporation of two or more professions.<sup>[5]</sup> Students and health professionals are working in isolation; they should understand the concept of IPE where professionals can learn from each other.

The present study was planned to develop and implement an interprofessional SIPM and to assess the performance and perception of study participants.

## Objectives

1. To identify the need for a SIPM
2. To develop and implement SIPM with interdepartmental and interprofessional integration as a learning tool
3. To assess the performance and perception of students after learning with SIPM
4. To assess the perception of facilitators about SIPM.

## Subjects and Methods

This is an educational, interventional, mixed-method study. The study participants were 108 first-year MBBS students and 25 facilitators of the institute.

Study Tool: Faculty interview guide, student's perception questionnaire, faculty perception questionnaire, SIPM, multiple choice questions (MCQs)-based pretest and post-test.

After ethical approval from the institutional ethics committee, need assessment interview of 25 facilitators from the departments of anatomy, orthopaedics, physical medicine and rehabilitation, physiotherapy, physiology, radiology, and sports coach/physical trainer was conducted. Qualitative data were recorded and analysed.

An interprofessional team of faculties/facilitators of the department of anatomy, orthopaedics, radiologist, physical

medicine and rehabilitation, physiotherapy, sports coach/physical trainer, sports committee member, and academic in charge was constituted.

Six interprofessional team discussion meetings were conducted for the sensitization and development of interprofessional sport injury modules.

IP SIPM was developed with 12 objectives. The module was validated by six experts. The item-level content validity index (I-CVI) was calculated. Items with a CVI between 1 and 0.79 were included in the module. One objective was scored less by experts, so it was removed by the IP team.

## Module content

The IP module on sports injury prevention was designed for healthcare professionals. The five-hour module was finalised by the IP team of experts through group discussions. It includes learning objectives (LOs), learning domains, teaching-learning methodology, and assessment methods.

## Module duration and delivery

The module was delivered in three sessions (five hours) during the last week of January 2024 and the first week of February 2024. Two interactive sessions were scheduled for two hours each session. One session of one hour was planned for the post-test, perception questionnaire, and feedback.

Before the first session, a pretest was conducted. During the first session, anatomy related to the musculoskeletal structure of the knee area, range, and axis of movements were discussed with the study participants. Active participation of students was ensured with the help of video presentations, problem-based discussions, role-play for showing movements, and question-answer sessions. At the end of the first session, reading material in the form of links to research articles and reference books was given to participants for self-directed learning.

The second session was planned for objectives related to common sports injuries around the knee region. This 2-hour student-centred session began with the sports injury experiences shared by the participants. Some cases of injuries from previous annual sports days were discussed. A brief introduction of common sports injuries like quadriceps and hamstring strains, knee bursitis, patellar tendinopathy, patellofemoral pain syndrome, knee ligament injury, iliotibial band syndrome, Osgood-Schlatter disease, meniscal injury, patellar fractures, and knee dislocations was given. A case-based discussion on common sports injuries around the knee joint, the mechanism of injury, basic management, and steps for injury prevention was conducted [Figures 1-3]. This interactive session engaged students in critical thinking and problem-solving approaches. Such problem-based scenarios not only allow the students to understand their roles and responsibilities in ensuring personal safety but also sensitise students to complex health systems.

Health scenarios like sports injuries that require IP collaboration and communication among doctors, nurses, physiotherapists, nutritionists, and physical trainers gave a glimpse of this complex system to students.

The third session was a one-hour session for assessment and feedback. Students' perceptions were recorded with the help of a pre-validated questionnaire on a Likert scale. An MCQ-based post-test was taken. The perception of the facilitators and students were recorded on a five-point Likert scale.

The performance of the students was assessed by comparing post-test and pretest results. A paired *t*-test was used to compare the pre- and post-test scores, and *P* values were derived based on the difference. An analysis of perception data from students and facilitators was done for the evaluation of the module.

An 18-year-old male came to the hospital with a history of left lateral knee pain which increases during running, cycling, and coming downstairs. Pain radiates to the lateral thigh region. On examination, there was focal tenderness over the left lateral femoral epicondyle at 30° of flexion.

- What is the most probable explanation of the above signs and symptoms?
- What is the initial management of the above condition?
- What are the preventive measures to avoid this condition?




Figure 1: Case 1

A 17-year-old female athlete came to the hospital with a complaint of pain around the left kneecap, knee pain that increases with stair climbing or squatting movements. She also complained about the clicking sound on bending or straightening the knee joint. On examination anterior knee area was tender.

- What is the most probable anatomical explanation of the above signs and symptoms?
- What are the initial management and preventive measures to avoid this condition?

Figure 2: Case 2

A 20-year-old football player came to the hospital with pain in the right knee area with difficulty in movements. He gave a history of falling on the right side while playing football. On examination Anterior Drawer sign was positive, and the medial side of the knee was tender on Palpation

- What is the most probable explanation of the above symptoms
- Why Medial meniscus is torn more frequently than lateral Meniscus
- What is unhappy Triad

Figure 3: Case 3

## Results

The results of the need assessment data are divided into themes. The findings of the qualitative data are shown in Table 1.

### Need assessment

The present study observed that there is still not very much clarity about the concept of IPE and IP collaboration. Facilitators were considering interprofessional and IPE as synonyms.

*“Interprofessional means horizontal and vertical integration between subjects of MBBS curriculum”*

*“Interprofessional means medicine, surgery, Laboratory sciences working together”.*

**Table 1: Interview data Need Assessment Qualitative Data**

- Define interprofessional collaboration
  - Integration between pre-, para, and clinical departments
  - Coordination among doctors, nurses, paramedical staff
  - Different professions like doctors, engineers, and administrators work together
- The requirement of interprofessional integration is for a better understanding of basic health sciences
- For getting more input from other professions
  - All aspects can be covered
  - To understand the significance of knowledge of the basic subject
- Previous experience of IP team-based educational activity
- ATLS course
  - Yoga training
- Teaching learning session on sports injury
- As part of regular PG teaching
  - As example during routine UG class
  - No experience
- Need of more effective/innovative teaching learning activity for teaching musculoskeletal anatomy for health professional students
- Development of critical thinking
  - For better understanding
- Module-based teaching learning activity
- Useful to maintain uniform quality
  - Avoid repetition
- IP SIPM can affect learner engagement and improve student learning
- Connect it with their own sports activity
  - More interesting than routine class
- Major limiting/hindering factors for the development of an interprofessional module-based teaching-learning activity
- Coordination
  - Lack of motivation
  - Professional ego
  - Any new concept needs time and resources
- Major limiting/hindering factors for the implementation of an interprofessional module-based teaching-learning activity
- Administrative willingness
  - Time limitation
  - Reluctant faculty
- Insights that you would like to share with us about an interprofessional SIPM-based teaching-learning activity
- Interviews of sports person can be included
  - Sensitization at the administrative level
  - Student involvement in module development

Facilitators agreed that there is a need for the IP SIPM for learning musculoskeletal anatomy, but it will require more time and effort from faculties. In their word

*“They will feel more connected to the topic”, and “Correlation with sports will enhance their attentiveness”.*

*“Teaching and raining activity will require more time and efforts of faculty”*

*“Time constrain is a major limiting factor”*

*“Administrative approval is a major challenge in the implementation of any interprofessional collaborative educational activity”*

### Module development

The sports injury module was developed with a total of 12 LOs and sent to experts for validation. The rating was given to each item (objectives) as per the criteria given below.

Relevance of content (degree of relevance)

- 1 – Not relevant
- 2 – Relevant but requires changes
- 3 – Relevant but minor modifications required
- 4 – Very relevant.

Face value of content (clear or comprehensive)

- 1 – Not clear
- 2 – Clear but requires changes
- 3 – Clear but minor modification required
- 4 – Very clear.

The ratings were recorded as 1 (for ratings of 3 or 4) or 0 (for ratings of 1 or 2). The I-CVI was calculated (sum of ratings provided by all experts on each item/total number of experts) [Table 2].

Items with a CVI between 1 and 0.79 were included in the module.

**Table 2: Validation score and I-CVI**

Objective No.	Content validation scores						I-CVI
	E1	E2	E3	E4	E5	E6	
1	1	1	1	1	1	1	6/6=1
2	1	1	1	1	1	1	6/6=1
3	1	1	1	1	1	1	6/6=1
4	1	1	1	1	1	1	6/6=1
5	1	1	1	1	1	1	6/6=1
6	0	1	1	1	1	1	5/6=0.83
7	1	0	1	1	1	1	5/6=0.83
8	0	1	1	1	1	1	5/6=0.83
9	1	1	1	1	1	1	6/6=1
10	1	1	1	1	1	1	6/6=1
11	1	1	1	1	1	1	6/6=1
12	0	0	1	1	1	1	4/6=0.66

Out of 12 objectives, one objective was discarded due to a low score. Finally, 11 objectives were included in the module.

### Students’ performance

A SIPM was implemented. Students’ performance was assessed before and after the session with the help of 10 MCQ-based pretest and post-test and test results were calculated. The average mark of the pretest was 4.7 (±1.7) and the post-test was 7.6 (±1.4) with  $P = 0.04$ .

### Students’ perception: [Table 3]

Seventy-eight (73.2%) students felt that their attention was better during interprofessional SIP module-based sessions than routine classes, and 87 (80.5%) students said that they could correlate better between theoretical knowledge and clinical aspect of the knee region after the SIP module-based session. Seventy-five (69%) students agreed that they became more aware of do’s for sports activities, and 73 (67.6%) students reported that they became more aware of don’ts for sports activities after the SIP module-based session. Eighty-four (77.8%) students agreed that interprofessional SIP modules can be utilised for the students of different health profession courses. Seventy-three (67.6%) reported that they get sensitized about the significance of teamwork in the health care system. 58.3 (63%) students agreed that they understood the significance of effective communication in the health care system. 41.6% of students reported that they get sensitised about the significance of interprofessional collaboration in the health care system during SIP module-based sessions.

### Facilitator’s perception: [Table 4]

All (100%) facilitators agreed that interprofessional collaboration is required for an effective teaching-learning activity for healthcare professionals and reported that IP SIPM provided sufficient information about the basics of sports activity and can improve students’ attention than routine classes. Seventy-five percent of facilitators felt that the students could be sensitized about the significance of effective communication in the health care system with module-based education. Ninety-six percent of facilitators reported that IP module-based sessions can provide better opportunities for student interaction.

## Discussion

Need assessment data from the present study showed that facilitators were not very familiar with the concept of module-based IPE. The facilitator felt that the sports injury module-based teaching-learning activity would help in maintaining uniform quality each time. According to them, for the development of critical thinking skills, there is a need for more effective/innovative teaching-learning activity. This study mentions how the capacity of medical graduates can be built on the concept of sports injury. As a primary care physician, they are the first point of contact when patients with such injuries report to them. Family physicians need to develop such competencies

**Table 3: Students' perception of SIPM-based session**

Item	Number of students				
	Strongly disagree	Disagree	Neutral/can't say	Agree	Strongly agree
My attention was better during IP SIPM-based sessions than during routine classes	9	7	14	59	19
SIPM-based sessions were more interactive than routine classes	2	9	28	56	13
The correlation was better between the theoretical clinical aspect after the SIPM-based session	2	1	18	50	37
I became more aware of do's for sports activities	6	4	23	49	26
I became more aware of don'ts for sports activities	5	6	24	47	26
I got sensitised about the significance of IP collaboration in the healthcare system	2	8	44	45	09
I get sensitised about the significance of effective communication in the health care system	2	7	34	47	16
I felt like more of a medical trainee after learning with the SIPM-based session	6	19	38	30	15
IP SIP module can be utilised for students of other health profession courses	3	5	16	56	28
I get sensitised about the significance of teamwork in the health care system	6	9	20	41	32

**Table 4: Facilitators perception of SIPM-based session**

Item	Number of facilitators				
	Strongly disagree	Disagree	Neutral/can't say	Agree	Strongly agree
IP collaboration is required for effective teaching-learning activities for students	0	0	0	4	21
IPE facilitates specific knowledge and skills training from different professions	0	0	0	22	03
IP education promotes the development of feelings of trust and respect for other professions among facilitators	0	0	0	23	02
Implementation of IPE can improve healthcare quality	0	0	01	05	19
IP SIPM provided sufficient information about the basics of sports activity	0	0	0	09	16
IPE needs more time and effort than regular class	0	0	0	10	15
Collaboration with other health professionals is a challenge	0	0	02	03	20
IP SIPM-based sessions can improve Students' attention than routine classes	0	0	0	07	18
IP SIPM-based sessions can provide more opportunities for student interaction	0	0	01	22	02
Module-based education sensitizes students to IP Collaboration	0	01	03	19	02
IP SIPM can be utilized for students of different health profession courses	0	0	0	10	15
Module-based education sensitizes students to effective communication in healthcare	0	0	06	18	01

and skills to know how to prevent and manage sports injuries at their level.

A study conducted at Taif University assessed the perception, readiness, and attitude of faculties and students towards IPE with the help of the readiness for interprofessional learning scale (RIPLS) questionnaire. They observed that only 10 participants had previous knowledge about IPE. Most of the participants in their study showed positive responses towards IPE.<sup>[6]</sup> A study conducted in the United Kingdom and Ireland reported that students showed very positive responses towards anatomy interprofessional education (AIPE). AIPE showed better student engagement, teamwork, and communication skill development.<sup>[7]</sup>

It was a challenge to bring together all members of the interprofessional team, including the anatomist, orthopedician, physiatrist, physiotherapist, radiologist, sports coach/physical trainer, and academic in charge, on the same platform for discussions multiple times. However, this issue was resolved by using a hybrid mode for the discussion meetings.

The facilitators were sensitised to the planning and development of the IP module with the help of expert presentations and discussions. The module was developed to cater to the requirements of the undergraduate level and was focused on providing clinically relevant learning of the musculoskeletal anatomy of the knee region, which is one of the most common

sites for sports injuries. Essential information about preventive measures to reduce the burden of sports injuries among students was also provided. During this process, students learned that the health system is a collaborative system and that effective collaboration and communication among doctors, paramedical staff, physiotherapists, and sports coaches/physical trainers can help in a smooth recovery and resumption of sports activity.

In the present study, performance data of students showed that the mean difference in the scores of student performance was statistically significant ( $P$  value  $\leq 0.05$ ).

Facilitators' and students' perception data from the current study showed that learning musculoskeletal anatomy with the use of interprofessional SIPM increased students' attention and engagement in the teaching-learning process. One hundred percent of the facilitators and 72.22% of the students agreed or strongly agreed on this point. Ninety-two percent of facilitators agreed that collaboration with other professionals is a challenge. One hundred percent of facilitators think that IP SIPM can be utilised for other professions. Seventy-six percent of facilitators agreed that students can be sensitised about the significance of effective communication in the health care system with module-based education.

A study conducted by Luke Wakely observed that there was a statistically significant improvement in students' attitudes towards IPE. IP module-based learning.<sup>[8]</sup> Tara Cusack in their study introduced an interprofessional module to 92 students of the health profession and reported that student satisfaction was very high.<sup>[9]</sup>

A study conducted by Berger *et al.* observed that students in the pre-clinical year were showing more positive attitudes towards IPE. Students accepted the relevance of IPE for better performance in the future.<sup>[10]</sup>

A study from South Africa developed a practical model for IPE for undergraduate healthcare professionals' training programs. The results of this project confirmed that the mixed-method practical model is effective for IPE.<sup>[11]</sup> Hewett TE generated evidence that neuromuscular training can decrease risk factors for knee joint cruciate ligament injury.<sup>[12]</sup>

Muscular weakness mainly vastus medialis can cause overpowering of structures of the lateral side like the iliotibial band, lateral retinaculum, and vastus lateralis. It can lead to patellar tilting, pain, and compression.<sup>[13]</sup>

In physically active adults, especially among runners, the leading causes of pain around the knee region are patellofemoral pain, iliotibial band friction syndrome, and patellar tendinosis. A better understanding of the musculoskeletal mechanism of this injury can help in finding measures for the reduction of the burden of these injuries and evidence-based management.<sup>[14]</sup>

About Elmagd in their study stated that in the field of sports, there are a great number of injuries that can occur. Coaches, trainers, and players must be aware of the causes, symptoms, prevention methods, and treatments for these common injuries. This knowledge can help prevent most of these types of injuries and improve training methods.<sup>[15]</sup>

A review conducted by Patel DR, Villalobos A observed that patellofemoral pain syndrome, also known as idiopathic anterior knee pain, is the most frequent cause of knee pain in young athletes. While various anatomical and biomechanical factors have been suggested to contribute to this type of pain, the primary cause is an overuse injury.<sup>[16]</sup>

The present study observed that students can learn the anatomical concepts and basic dos and don'ts of sports activities at the same time. This awareness about sports injuries will help them in their clinical postings, where they can spread this awareness among patients with actively involved in the sports activity. Faculty can develop similar modules for other sports injuries.

The current project was focused on the concept of the introduction of interprofessional module-based education since the preclinical phase of medical education to enhance students' interest and interaction. Incorporation of multiple departments as well as professionals in the preparation of teaching-learning sessions for the sensitisation of students about integrative and collaborative practices.

## Conclusions

Interprofessional module-based teaching and learning activities can provide a better learning experience. In particular, the sports injuries prevention module (SIPM) can help raise awareness about sports injuries. The interprofessional (IP) module can also be used to train other healthcare professionals. By introducing IPE in the preclinical phase of medical education, students can become more aware of integrative and collaborative practices right from the beginning of their training as health professionals.

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## Conflicts of interest

There are no conflicts of interest.

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