Original Paper

Preimplementation Needs Assessment for English-Medium Instruction Among Medical Students at a Moroccan Public Medical Faculty: Cross-Sectional Study

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Abstract

Background: English-medium instruction (EMI) is increasingly considered in medical education. Before implementation in public institutions in non-Anglophone, resource-constrained, postcolonial contexts, planning requires an understanding of students' perceived academic-language needs, learning-resource needs, previous preparation, and preferences for structural and pedagogical support.

Objective: This preliminary, preimplementation needs assessment aimed to describe students' perceived pedagogical needs for studying medicine in English, perceived resource needs, previous EMI-related preparation, and preferences for structual and pedagogical support at a Moroccan public medical faculty.

Methods: This exploratory cross-sectional secondary analysis used previously unreported needs-assessment data from a sample of clinical-phase second-cycle medical students (N=102). A self-administered questionnaire assessed students' perceived pedagogical and resource needs, previous EMI-related preparation, and preferences for structural and pedagogical support before potential EMI implementation. Exploratory factor analysis was used to evaluate the psychometric properties of the needs-assessment items. Composite subscale scores were compared across course years using the Kruskal-Wallis test.

Results: Among the 102 students, high pedagogical needs were reported, particularly for medical terminology (n=91, 89.2%) and academic speaking (n=89, 87.3%), as well as high resource needs, including access to online medical English courses (n=95, 93.1%). Furthermore, 69 (67.6%) students reported no prior training related to studying through EMI. The most highly endorsed forms of institutional support were regular medical English courses (n=87, 85.3%) and regular academic English courses (n=80, 78.4%). In addition, 68 (66.7%) students supported the translation of concepts and the use of French in class, whereas mandatory English-certification requirements were supported by only a minority of students (n=41, 40.2%). Composite subscale scores did not differ significantly across course years (all $P>.05$).

Conclusions: Medical students reported substantial pedagogical and resource needs and clear preferences for structural and pedagogical support before potential EMI implementation; most reported no prior training related to studying through EMI. Regular medical and academic English courses were the most strongly endorsed forms of institutional support. A majority of students supported the translation of concepts and the use of French in class, whereas mandatory English-certification requirements received limited support. These findings provide a student-informed basis for planning a future EMI curriculum

in this public medical faculty, including preparatory medical and academic English courses, accessible learning resources, and language-support arrangements. As a preliminary, preimplementation needs assessment, this study describes self-reported needs and preferences rather than experiences, learning outcomes, or intervention effects in an established EMI curriculum.

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Keywords: English-medium instruction; medical education; needs assessment; content and language integrated learning; cognitive load theory; bilingual education; educational equity; Morocco

Introduction

English as the Global Language of Medicine

The globalization of health care and the imperative to engage with the international medical community have established English as the dominant lingua franca of global medical science, research, and clinical training [1,2]. Previous literature has recognized English proficiency as a determinant of successful engagement with international medical literature, terminology, and professional communication, and as an essential prerequisite for international conferences and research dissemination [2]. To ensure graduates remain globally competitive, non-Anglophone countries are increasingly introducing English-medium instruction (EMI) into medical education [3,4]. Empirical evidence further suggests that this growth is driven as much by institutional priorities, such as global rankings and international recruitment, as by pedagogical considerations [5].

The Emerging Shift to EMI in Moroccan Public Medical Education

While private institutions in high-income settings have rapidly integrated EMI, public medical schools in resource-constrained, non-Anglophone, and postcolonial contexts across the Global South face distinct structural challenges [6]. In countries with historically entrenched media of instruction, such as Morocco's francophone system, EMI implementation represents a profound systemic disruption [7,8]. This disruption is compounded by tensions among multilingualism, linguistic dependency, and epistemic justice that characterize Moroccan higher education more broadly [7]. To address these tensions and to match global academic and professional demands, a recent Moroccan educational reform has committed to democratizing EMI [9,10]. Evidence from Moroccan health-sciences EMI [11] and from research in scientific disciplines in Saudi Arabia [12] highlights the importance of language preparation and support for successful implementation.

Socioeconomic Barriers and Educational Equity

Historically, French, as the language of instruction, has often functioned as a marker of social distinction, favoring students from advantaged educational backgrounds who can afford structured language training [13-15]. Furthermore, mandatory English certifications raise critical equity concerns [11,15,16]. Because foreign language mastery often marks elite social status, requiring prior English proficiency acts as an institutional barrier that exacerbates socioeconomic and educational disparities [13,15,16]. Beyond certification requirements, the broader financial costs associated with EMI readiness, such as preparatory private courses, may further constrain access among less advantaged students [13,15,16]. Considered altogether, these barriers contrast with the increasing accessibility of English through informal digital exposure, potentially acting as an educational equalizer that enables students from less privileged backgrounds to pursue educational opportunities previously restricted to the elite [11,14,15]. Nonetheless, some authors caution that EMI expansion in the Global South may reproduce, rather than resolve, existing linguistic hierarchies, calling for a critical, decolonial examination of whose interests EMI programs ultimately serve, particularly where such programs are limited to costly private institutions [17].

English Readiness in Medical EMI: Basic Interpersonal Communicative Skills, Cognitive Academic Language Proficiency, and Translanguaging

However, while informal exposure fosters basic receptive skills, successful participation in medical EMI requires productive, cognitive academic language proficiency (CALP) [18]. This distinction is formalized in the framework developed by Cummins [19], which separates students' basic interpersonal communicative skills (BICS), often developed through everyday communication, from their CALP, which is required for processing dense medical content. English proficiency is identified as a predictor of academic performance in EMI settings [18]. More specifically, deficits in productive academic English skills, particularly speaking and writing, have been identified as major challenges during medical training [20]. To address these deficits, a transitional bilingual approach incorporating translanguaging, previously deemed detrimental by traditional pedagogy, can serve as a valuable instructional scaffold during early medical studies while exposure to academic English progressively increases [16,21,22].

Consequently, public faculties face a paradox: although English may bypass the entrenched elitism of French, students from diverse socioeconomic backgrounds may require additional support to develop the specific academic language readiness required for medical education [23]. Although much research now exists on EMI readiness more broadly [18], this question remains largely unexamined in medical and health sciences EMI in North African contexts [11].

Cognitive Load and Stress in Medical EMI

Beyond structural disparities, learning medicine in a new medium imposes substantial cognitive demands [20]. Medical students experience significant baseline psychological pressure from demanding workloads and chronic sleep deprivation, reflecting growing academic stress within medical studies globally [24-26]. This cognitive and emotional burden is exacerbated in EMI curricula, where students must simultaneously process complex medical concepts and decode a foreign language. This dual cognitive burden can trigger anxiety and impede academic performance if unmanaged [26-28]. From a cognitive psychology perspective, this dual challenge is best conceptualized through cognitive load theory (CLT) developed by Sweller [27], which posits that working memory capacity is limited [29]. In medical EMI, complex concepts generate high intrinsic load, while processing a new instructional medium introduces a substantial extraneous load.

When medical students expend excessive mental effort processing unfamiliar English medical content, the extraneous load associated with the instructional medium may leave fewer working-memory resources available for schema construction and deep clinical reasoning [29,30]. Without effective instructional support, these combined loads can surpass working memory capacity, hindering the germane load required for schema construction and long-term retention [30,31]. This risk may be particularly acute during early clinical immersion, where the intrinsic complexity of patient care is already high [30]. Despite EMI's rapid global expansion, research remains scarce on the pedagogical and institutional support that could help medical students manage these additional language-related demands [4,11]. Moreover, CLT itself remains debated. Critics have questioned the empirical distinctiveness of intrinsic, extraneous, and germane load, as well as the reliability of measuring their additivity and the robustness of phenomena such as the expertise reversal effect [30,32,33]. Some authors have further suggested that, in high-stress clinical EMI settings, compounded psychosocial and cognitive stress may lead even advanced learners to display novice-like behavior [25,26,30,32-34]. In the present study, CLT is used only as a theoretical framework for contextualizing students' perceived support needs; cognitive load, working memory, clinical reasoning, and academic performance were not directly measured.

Content and Language Integrated Learning and Institutional Scaffolding in EMI

Furthermore, while EMI challenges are widely documented, few empirical studies have examined students' perceived pedagogical and resource needs in contexts considering the implementation of EMI, nor have they mapped these needs onto actionable instructional frameworks. Content and language integrated learning (CLIL), a dual-focused approach integrating subject content and language instruction, has been proposed to respond to these demands and has been adapted to medical education through European frameworks such as CLIL in Medical Education (CLILMED), which combine medical content with English skills concurrently [35-37]. Comparable CLIL-informed curricula have been described in medical education in Colombia, where students reported favorable perceptions of integrated content-language teaching [38], and in European higher education [39].

In the Moroccan context, institutional support is central to EMI implementation, particularly in systems transitioning from French or Arabic to English. For instance, emerging EMI initiatives include institutional training in medical English for pedagogical staff, such as the university certification offered at Mohammed VI University of Sciences and Health (UM6SS) [40,41]. Research on EMI training similarly shows that such initiatives can reshape educators' teaching practices [40], reinforcing the need for structured support at the institutional level. Although the present study did not evaluate CLIL frameworks or institutional training support, these approaches may provide relevant options for addressing students' perceived pedagogical and resource needs and warrant prospective evaluation in Moroccan public medical education.

Research Gap and Study Objectives

Few studies in Moroccan health sciences have examined the pedagogical and resource needs that students perceive as necessary before the potential implementation of EMI in Moroccan public medical education. A previously published companion study from the same sample and questionnaire reported demographic characteristics and examined students' self-perceived English proficiency and English exposure, perceptions and attitudes toward English and EMI, and individual-level factors associated with willingness to enroll in an EMI program [42]. The present study reports a secondary analysis of previously unreported questionnaire data on students' perceived pedagogical and resource needs, prior preparation for an EMI program, and preferences for structural and pedagogical support before potential EMI implementation. Specifically, this study aims to (1) describe students' perceived pedagogical needs for studying medicine through English; (2) describe their perceived resource needs and prior preparation relevant to EMI; and (3) identify students' preferences for structural and pedagogical support before potential EMI implementation.

Methods

Study Design

This was a preliminary, preimplementation cross-sectional needs assessment conducted before the introduction of an English-medium curriculum at the Faculty of Medicine and Pharmacy of Rabat (FMPR). Participants had not previously experienced EMI in their medical training; therefore, the findings reflect perceived and anticipated needs and preferences rather than difficulties experienced within an implemented EMI program.

This research was an exploratory, observational, cross-sectional study conducted at the public FMPR during the 2023 to 2024 academic year. The study adhered to the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines (Checklist 1). A quantitative approach was used to assess students' perceived pedagogical needs for EMI, their perceived resource needs, and their preferences for structural and pedagogical support before potential EMI implementation.

Participants and Setting

The study included the same convenience sample of 102 clinical-phase medical students (years 3-6) surveyed at FMPR during the 2023 to 2024 academic year, as in the companion study [42]. Detailed participant characteristics and recruitment procedures have been reported previously [42]. The inclusion criteria required participants to be able to complete the questionnaire in either French (the current medium of instruction at FMPR) or English. Students who declined to participate or who submitted incomplete questionnaires were excluded from the study. Ultimately, all 102 participants completed the French version of the questionnaire.

Ethical Considerations

According to the Ethics Committee for Biomedical Research (CERB) at the FMPR and Article 2 of Moroccan Law No. 28-13, noninterventional observational research falls strictly outside the scope of formal biomedical ethics review [43]. Accordingly, no formal ethics approval or exemption was applied for this educational survey, and no protocol number is applicable. Nevertheless, the study was conducted in strict accordance with the ethical principles of the Declaration of Helsinki. All participants provided written informed consent prior to participation. No identifying or sensitive personal information was collected, and all responses were gathered anonymously.

Study Instrument

This study draws on the same cross-sectional sample and the shared self-administered questionnaire as a previously published companion study on medical students' perceptions and attitudes toward EMI [42]. The complete questionnaire is provided in Multimedia Appendix 1 (English) and Multimedia Appendix 2 (French).

The companion study reported findings from questionnaire sections I to III, including students' perceived English proficiency, attitudes toward English and EMI, and individual-level sociodemographic and attitudinal factors associated with EMI choice [42].

The present secondary analysis reports previously unpublished data from section IV, which investigated students' perceived pedagogical needs for EMI, perceived resource needs, prior EMI-related preparation, and students' preferences for structural and pedagogical support before potential EMI implementation.

The questionnaire's pilot testing and expert content validation are described in detail in the companion study [42].

Of the 9 items in Q22 of section IV (students' preferences for structural and pedagogical support before potential EMI implementation), 2 items were excluded a priori: "if it offers a bilingual French-English training" and "if translation of concepts and use of French are tolerated in class." These items conceptually assessed students' broader language-policy preferences rather than specific programmatic support.

To assess the construct validity and dimensional structure of the items assessing students' EMI needs, we initially conducted an exploratory factor analysis (EFA) using maximum likelihood extraction and varimax rotation. The EFA included 19 Likert-type items from section IV: Q13, students' perceived pedagogical needs for EMI (6 items); Q14, students' perceived resource needs for EMI (6 items); and Q22, students' preferences for structural and pedagogical support before potential EMI implementation (7 items). Unlike the companion study, which examined individual-level sociodemographic and attitudinal predictors of students' EMI choice [42], these section IV items examined students' preferences for structural and pedagogical support before potential EMI implementation.

The analysis supported a 3-factor solution corresponding to students' perceived pedagogical needs for EMI, students' perceived resource needs for EMI, and students' preferences for structural and pedagogical support before potential EMI implementation. Two items were excluded from the final composite subscale on psychometric grounds: "if it offers regular classes in medical English every year" because of its low factor loading (0.18), and "it offers regular classes in academic English every year" because of its low corrected item-total correlation and negligible factor loading. Both items are therefore reported descriptively only. The 3 subscales comprised 17 items: 6 pedagogical-needs items, 6 resource-needs items, and 5 structural and pedagogical support items. The EFA was rerun on the final 17-item set and supported the same 3-factor structure, with good sampling adequacy (Kaiser-Meyer-Olkin [KMO] measure =0.826; Bartlett test of sphericity, $\chi^2_{136}=829$; $P<.001$). The 3 factors explained 50.8% of the total variance, and primary factor loadings ranged from 0.39 to 0.85 [44]. The internal consistency of these subscales was assessed using Cronbach α, demonstrating acceptable to good reliability across subscales [45].

Data Collection

Data collection procedures are described in detail in the companion study [42]. Briefly, 130 self-administered paper-based questionnaires were distributed in person to medical students during the 2023 to 2024 academic year, of which 102 were fully completed and included in this secondary analysis of section IV data.

Statistical Analysis

Statistical analysis was performed using the open-source software Jamovi (version 2.6.26) [46]. For descriptive analyses, Likert-type response scales were recoded into 3 categories (agree, neutral, and disagree). Descriptive statistics

were generated, expressing categorical variables as frequencies and percentages.

Composite scores were computed for each of the 3 EFA-derived subscales (students' perceived pedagogical needs for EMI, students' perceived resource needs for EMI, and students' preferences for structural and pedagogical support before potential EMI implementation) by averaging their constituent items. A nonparametric test was used due to the ordinal nature of the Likert-derived composite scores and the unequal sizes of the course-year groups. Differences across the 4 course years were assessed using the Kruskal-Wallis test, with epsilon-squared (ε^2) reported as a measure of effect size. Statistical significance was set at $P<.05$.

Results

Psychometric Properties of the Instrument

The EFA of the 17 retained section IV items supported a 3-factor structure for students' perceived pedagogical needs, perceived resource needs, and students' preferences for structural and pedagogical support before potential EMI implementation. The data demonstrated good suitability for factor analysis (KMO measure=0.826; Bartlett test of sphericity: $\chi^2_{136}=829$; $P<.001$). The 3 retained factors together explained 50.8% of the total variance. Factor loadings ranged from 0.39 to 0.85 for all retained items. The final subscales comprised 6 pedagogical-needs items, 6 resource-needs items, and 5 structural and pedagogical support items. Internal consistency was good for pedagogical needs (Cronbach α=0.869) and resource needs (Cronbach α=0.830), and acceptable for structural and pedagogical support (Cronbach α=0.772). Table 1 summarizes the psychometric properties of the 3 factors.

Table 1. Psychometric properties of the exploratory factor analysis (EFA) factors[a].

Psychometric properties and EFA-derived factors	Items (n)	Factor loadings	Cronbach α
Students' perceived pedagogical needs for EMI[b]	6	0.52-0.85	0.869
Students' perceived resource needs for EMI	6	0.44-0.85	0.830
Students' preferences for structural and pedagogical support before potential EMI implementation[c]	5	0.39-0.77	0.772

[a]Kaiser-Meyer-Olkin (KMO)=0.826; Bartlett test of sphericity: $\chi^2_{136}=829$; $P<.001$; total variance explained was 50.8%.
[b]EMI: English-medium instruction.
[c]Four items from the original 9 Q22 items were excluded: 2 a priori (distinct language-policy construct), 1 for low corrected item-total correlation and negligible loading, and 1 for a low factor loading (0.18). The latter 2 are reported descriptively only.

Participant Characteristics

Participant demographics, including age, sex, English exposure, and English certification were described in detail in the companion study [42]. The present secondary analysis included 102 clinical-training medical students: 39 (38.2%) were in the third year, 28 (27.5%) in the fourth year, 20 (19.6%) in the fifth year, and 15 (14.7%) in the sixth year.

Students' Perceived Pedagogical Needs for EMI

Students reported substantial perceived gaps in their academic language readiness. When evaluating their pedagogical needs for a potential EMI implementation, students reported a high level of perceived need, with agreement ranging from 65.7% (67/102) to 89.2% (91/102) across all 6 items (Table 2).

Table 2. Students' perceived pedagogical needs for EMI[a] (N=102).

Item	Agree, n (%)	Neutral, n (%)	Disagree, n (%)
Academic speaking (eg, presentations)	89 (87.3)	10 (9.8)	3 (2.9)
Academic listening (eg, lectures)	88 (86.3)	9 (8.8)	5 (4.9)
Academic reading (eg, textbooks)	78 (76.5)	19 (18.6)	5 (4.9)
Academic writing (eg, assignments)	79 (77.5)	16 (15.7)	7 (6.9)
Academic vocabulary	91 (89.2)	7 (6.9)	4 (3.9)
Grammar	67 (65.7)	25 (24.5)	10 (9.8)

[a]EMI: English-medium instruction.

Among the 102 medical students, academic vocabulary (medical terminology) emerged as the highest priority (n=91, 89.2%). Students also expressed strong needs for support in productive and receptive academic skills, with speaking (n=89, 87.3%) and listening (n=88, 86.3%) identified as primary areas of concern, and reading (n=78, 76.5%) and writing (n=79, 77.5%) reported slightly less frequently. General language scaffolding, such as grammar support, was rated as the lowest priority among the listed pedagogical needs (n=67, 65.7%). Table 2 summarizes the students' perceived pedagogical needs for EMI.

Students' Perceived Resource Needs for EMI

Students reported substantial perceived needs for pedagogical and technological resources to facilitate learning during a potential EMI implementation. Access to websites for medical students was the most frequently endorsed resource need (96/102, 94.1%), followed by access to medical English online courses (95/102, 93.1%). Students also expressed perceived needs for medical English tutorials with activities and exercises for doctors (94/102, 92.2%).

A majority of students (69/102, 67.6%) reported no prior training related to studying through EMI. Among the reported training options, academic English courses were the most frequently cited (16/102, 15.7%), followed by general English courses (12/102, 11.8%), e-learning platform courses (7/102, 6.9%), and videoconferencing courses (3/102, 2.9%; Table 3).

Table 3. Students' prior training related to studying through EMI[a] (N=102).

Type of training	Values, n (%)[b]
No prior training	69 (67.6)
Academic English courses	16 (15.7)
General English courses	12 (11.8)
E-learning platform courses	7 (6.9)
Video-conferencing courses	3 (2.9)

[a]EMI: English-medium instruction.
[b]Percentages do not sum to 100% as participants could select more than one option.

Students also expressed perceived needs for more general English resources, such as websites for general English (82/102, 80.4%) and websites for online grammar with exercises (76/102, 74.5%). Finally, 84 of 102 (82.4%) students agreed that subscriptions in international professional associations would be beneficial for studying medicine through EMI. Table 4 summarizes the students' perceived resource needs for EMI.

Table 4. Students' perceived resource needs for EMI[a] (N=102).[b]

Resources	Agree, n (%)	Neutral, n (%)	Disagree, n (%)
Access to medical English online courses	95 (93.1)	3 (2.9)	4 (3.9)
Access to websites for medical students	96 (94.1)	3 (2.9)	3 (2.9)
Access to medical English tutorials, with activities and exercises for doctors	94 (92.2)	6 (5.9)	2 (2.0)
Websites for general English	82 (80.4)	18 (17.6)	2 (2.0)
Websites for online grammar with exercises	76 (74.5)	22 (21.6)	4 (3.9)
Subscriptions in international professional associations	84 (82.4)	14 (13.7)	4 (3.9)

[a]EMI: English-medium instruction.
[b]Percentages may not total 100% because of rounding.

Students' Preferences for Structural and Pedagogical Support Before Potential EMI Implementation

Students expressed strong preferences for structural and pedagogical support before potential EMI implementation. Regular medical English classes every year were the most frequently endorsed support measure (87/102, 85.3%), followed by regular classes in academic English every year (80/102, 78.4%). Both items were excluded from the final composite subscale on psychometric grounds: the item "if it offers regular classes in medical English every year" because of its low factor loading (0.18) and the item "if it offers regular classes in academic English every year" because of its low corrected item-total correlation and negligible factor loading. Both items are reported descriptively only.

Students also supported the use of English for lectures (71/102, 69.6%) and examinations (59/102, 57.8%). However, support was lower for a certified English proficiency requirement for incoming students, with 41 of 102 (40.2%) students agreeing, and for discussions being conducted exclusively in English (43/102, 42.2%). Table 5 summarizes the students' preferences for structural and pedagogical support before potential EMI implementation.

Table 5. Students' preferences for structural and pedagogical support before EMI[a] implementation (N=102).

EMI characteristics	Agree, n (%)	Neutral, n (%)	Disagree, n (%)
It is exclusively in English	42 (41.2)	21 (20.6)	39 (38.2)
If it offers a bilingual French-English training[b]	70 (68.6)	15 (14.7)	17 (16.7)
If it offers regular classes in academic English every year[c]	80 (78.4)	15 (14.7)	7 (6.9)
If it offers regular classes in medical English every year[d]	87 (85.3)	10 (9.8)	5 (4.9)

EMI characteristics	Agree, n (%)	Neutral, n (%)	Disagree, n (%)
If there is a certified English proficiency requirement for incoming students (IELTS[e] and TOEFL[f])	41 (40.2)	32 (31.4)	29 (28.4)
The lectures are in English	71 (69.6)	19 (18.6)	12 (11.8)
The examinations are in English	59 (57.8)	20 (19.6)	23 (22.5)
If translation of concepts and use of French are tolerated in class[b]	68 (66.7)	25 (24.5)	9 (8.8)
Lectures discussions are exclusively in English	43 (42.2)	33 (32.4)	26 (25.5)

[a]EMI: English-medium instruction.
[b]Excluded a priori from the factor analysis (as a distinct construct).
[c]Excluded from the final composite subscale because of a low corrected item-total correlation and negligible factor loading; reported descriptively only.
[d]Excluded from the final composite subscale because of a low factor loading (0.18) and reported descriptively only.
[e]IELTS: International English Language Testing System.
[f]TOEFL: Test of English as a Foreign Language.

The language-policy items excluded a priori from the factor analysis are also shown in Table 5. Students supported a bilingual French-English training (70/102, 68.6%), and 68 of 102 (66.7%) participants supported translation of concepts and the use of French in class. In contrast, 42 (41.2%) students agreed that the program should be conducted exclusively in English.

Students' Perceived Needs and Preferences for Structural and Pedagogical Support Across Course Years

Composite scores for students' perceived pedagogical needs, perceived resource needs, and preferences for structural and pedagogical support before potential EMI implementation did not differ significantly across the 4 course years according to Kruskal-Wallis tests (Table 6).

Table 6. Comparison of composite subscale scores across course years (N=102)[a].

Subscale	Kruskal-Wallis chi-square (*df*=3)	*P* value	Effect size, ε^2
Students' perceived pedagogical needs for EMI[b]	2.97	.40	0.029
Students' perceived resource needs for EMI	2.75	.43	0.027
Students' preferences for structural and pedagogical support before potential EMI implementation	5.72	.13	0.057

[a]Course-year group sizes were 39 third-year students, 28 fourth-year students, 20 fifth-year students, and 15 sixth-year students.
[b]EMI: English-medium instruction.

Discussion

Language Barriers and Social Inequities

This study highlighted substantial perceived support needs across academic skill areas. Medical terminology, academic speaking, and academic listening emerged as the most frequently endorsed areas for support, closely followed by academic writing and reading.

Taken together with the self-reported proficiency and everyday English-use findings previously reported in the companion study [42], the newly reported perceived needs data suggest a possible gap between everyday English use and perceived preparedness for academic medical communication. This perceived gap may reflect the predominantly informal and self-directed nature of students' English exposure reported in the companion study [42], which may not fully prepare students for the discipline-specific and productive academic language skills required in medical EMI. A gradual transition toward autonomous academic English may therefore require sustained motivation, regular engagement, and institutional support, including bilingual educators with both communicative competence and disciplinary expertise [21].

This perceived difference between everyday and academic English demands can be interpreted through the BICS/CALP distinction proposed by Cummins [19], which distinguishes conversational fluency from the oral and written academic language required to understand and communicate complex concepts in educational settings. However, the present study did not assess students' actual academic-language proficiency, cognitive load, or academic performance. This interpretation should therefore be examined in future implemented medical EMI contexts.

Clinical training may introduce an additional challenge: medical students need to communicate effectively with local patients, in Arabic in Moroccan hospitals and in French during rotations in France, while also preparing to use English as an international lingua franca [7]. Students' preferences may reflect this dual demand. Notably, a majority of participants supported a bilingual French-English training, as well as translation and the use of French in class.

This preference for a bilingual curriculum may be interpreted in light of the linguistic interdependence

hypothesis proposed by Cummins [19], which suggests that strengthening academic skills in a dominant language, such as Arabic or French in Morocco, may facilitate academic English development, provided that structured instructional support is available. Given students' reported preferences for bilingual instruction, a temporary bilingual framework may support their transition to a new instructional medium. Although this hypothesis was not tested in the present study, it offers a rationale for prospectively evaluating transitional bilingual approaches in medical EMI. Such approaches should be assessed for their feasibility, acceptability, and effects on language development and academic learning in public medical faculties such as FMPR.

Although CLIL and translation-oriented approaches have shown promising results in other non-Anglophone EMI settings [36,38], their effectiveness in public medical faculties such as FMPR and similar settings remains underexplored.

Students' Preferences for Structural and Pedagogical Support Before Potential EMI Implementation

Regular medical and academic English classes received the highest level of support among institutional-support measures before potential EMI implementation. Both items were subsequently excluded from the final composite subscale on psychometric grounds and are reported here descriptively. These preferences are consistent with the role of English in accessing up-to-date scientific literature and international medical practices, communicating with the global medical community, and disseminating research [2,4]. Such courses could help students develop the medical terminology, scientific writing, and academic communication skills needed throughout their medical training [2,18].

Students also supported a bilingual French-English training, the translation of concepts, and the use of French in class. This finding suggests that students may prefer an EMI curriculum that integrates language support rather than one that requires prior proof of English proficiency.

However, pedagogical measures alone cannot address all EMI-related equity concerns. Within diverse public medical institutions, such as FMPR, conditioning access to EMI on costly English certifications may disadvantage under-resourced students, as obtaining such certifications often requires costly private preparation [16]. This may create a socioeconomically selective admission process, excluding otherwise qualified students who lack the financial means to access private English instruction or certification preparation. Such requirements may therefore not fully reflect students' academic readiness for medical EMI [16]. In this context, only a minority of participants advocated for mandatory English certification at admission. In the absence of validated, context-specific measures of EMI readiness, institutions often resort to such proficiency prerequisites rather than implementing tailored pedagogical scaffolding [21].

CLT-Informed Pedagogical Support

Students most frequently reported perceived needs for support in medical vocabulary, academic speaking, and academic listening, whereas academic reading and writing were endorsed less frequently. These findings describe students' anticipated language-support needs before potential EMI implementation. They do not measure cognitive load, mental effort, working memory, clinical reasoning, stress, or academic performance. Accordingly, CLT is used solely as an interpretive theoretical framework for future research rather than as an empirically tested explanation of the reported needs.

Within CLT [27], the complexity of a learning task and the way in which information is presented are considered relevant to the demands that learning activities may place on learners. This general theoretical perspective may be useful for future studies examining how language and content demands interact in implemented EMI curricula among students educated in Arabic or French. However, it was not tested in the present study and should not be used to infer cognitive burden from the reported needs. The present findings may inform the prospective evaluation of accessible support measures, such as bilingual glossaries, multimodal materials, visual supports, guided practice, and integrated medical English instruction [29-31,36]. The findings should be considered alongside the wider EMI literature in health-professions education, which documents linguistic and pedagogical challenges associated with studying complex clinical content through English [4]. Future studies should evaluate the feasibility, acceptability, and associations of these forms of support with language development, content learning, and academic outcomes in EMI curricula in similar settings.

Needs Across Clinical Course Years

Composite scores for perceived pedagogical needs, resource needs, and preferences for structural and pedagogical support before potential EMI implementation did not differ significantly across clinical course years in this sample. This exploratory finding suggests that support needs are perceived as necessary across all stages of clinical training. This should be interpreted with caution: given the small and unequal subgroup sizes, the absence of statistical significance neither demonstrates nor rules out changes in language demands with clinical experience. Longitudinal or postimplementation research with larger samples would be needed to examine such processes.

This finding may also reflect the fact that EMI has not yet been implemented at this Moroccan public medical faculty: students across all course years are evaluating the perceived needs of a curriculum they have not yet experienced, rather than reporting on lived difficulties within an ongoing EMI program. Their responses should therefore be interpreted as anticipated needs and preferences before potential EMI implementation. The present study cannot determine whether these perceived needs would change following exposure to EMI or whether such changes would be associated with clinical experience.

Should EMI be introduced at FMPR, repeated cross-sectional assessments of successive student samples across the implementation period in the same educational setting may provide a more direct test of whether perceived needs evolve with lived EMI experience and could inform the iterative refinement of pedagogical and resource support for the EMI program.

Regardless of whether the intensity or nature of support needs differs across stages of clinical training, the high reported levels of pedagogical and resource needs across the sample highlight the need for institutional approaches that integrate language development with medical learning.

Institutional Support: The Potential Role of CLIL in Equitable EMI Implementation

Medical schools may need to simultaneously support students' language development and educators' pedagogical preparedness for dual-focus teaching. This may require comprehensive educational resources, medical English training for staff, and structured professional development in evidence-based English instruction, rather than relying primarily on students' individual efforts to prepare for potential EMI implementation [21,40]. Beyond English proficiency, training medical educators in pedagogical approaches for integrated content and language teaching may help develop the skills needed to deliver EMI effectively [35,37]. For instance, UM6SS offers a university certification in medical English for pedagogical staff [41].

At UM6SS, the combination of general English courses and medical terminology modules, alongside student-centered approaches such as problem-based learning, clinical reasoning activities, and technology-enhanced simulations, has been described as supporting both grammatical accuracy and clinical discourse acquisition [11,41]. Drawing on the broader literature, the integration of low-stakes testing, problem-based learning, and structured instructional approaches may be considered for prospective evaluation as a way of supporting content and language learning in EMI contexts [29,30]. CLILMED may offer a framework for operationalizing this focus through coteaching, mentoring, simulation-based learning, flipped classrooms, peer-assisted activities, level-adjusted input, and formative e-learning resources [36,37].

In public medical faculties such as FMPR, where students have diverse educational and language backgrounds, CLIL may provide structured, curriculum-embedded English-language support, thereby reducing reliance on individual efforts and helping to mitigate inequities in access to external language preparation [35,38]. Internationally, CLIL-informed methods have generally been reported as acceptable in some medical-education settings and as approaches intended to integrate disciplinary content and English [38,39]. Although our survey did not evaluate CLIL or CLILMED interventions directly, these frameworks are conceptually relevant to the anticipated pedagogical, resource, and structural support needs reported by this sample. They therefore warrant empirical evaluation following EMI implementation at FMPR and in comparable public, francophone medical faculties.

Given the unequal access to costly private English training discussed previously, embedding language objectives directly within the curriculum, as proposed by CLIL, offers a structural alternative to relying primarily on self-directed language preparation. This approach may reduce barriers for students with limited opportunities for formal English preparation, who might otherwise be excluded by strict entry-level language requirements [35,37].

However, English proficiency alone does not determine success in EMI settings. Student engagement and performance are also shaped by academic confidence, learning conditions, and the extent of pedagogical support available [26]. Institutions may therefore consider combining rigorous scientific and language standards with appropriate pedagogical support, especially during the early stages of implementation [30,33].

Comparison With Prior Work

Although interest in EMI has been reported in previous studies [42], interest alone does not necessarily translate into readiness for EMI. The substantial anticipated pedagogical and resource needs identified in the present preimplementation analysis underscore the importance of considering language and institutional support before potential implementation. Research among medical students in Saudi Arabia has similarly reported perceived language needs and difficulties related to medical terminology, academic speaking, and listening within EMI contexts [6,20,23]. These findings partly mirror FMPR students' anticipated needs in these areas, underscoring the potential value of pedagogical support and targeted language solutions before potential EMI implementation.

Similarly, recent findings from Saudi Arabia have documented the use of translanguaging and translation among medical students in an EMI curriculum, echoing our sample's preference for concept translation and highlighting the role of multilingualism in clinical communication [47].

Limitations

Several limitations to this study should be acknowledged. First, participants had not yet experienced EMI in their medical training; the findings, therefore, reflect anticipated needs and preferences rather than needs experienced within an implemented EMI curriculum and may evolve once EMI is adopted. Second, this single-center study, conducted at FMPR and based on a relatively modest sample size, may limit the generalizability of the findings. In addition, the absence of statistically significant differences in composite need scores across course years in the Kruskal-Wallis analysis should be interpreted cautiously, as subgroup sizes were small and unequal, which may have limited the power to detect modest between-year differences. These findings should, therefore, be interpreted within the specific context of a francophone-educated, socioeconomically diverse student population in a resource-constrained setting. Third, the findings rely on self-reported perceptions of pedagogical

and resource needs, which may not fully reflect students' actual language abilities. Fourth, the cross-sectional design captured students' perspectives at a single point in time, precluding causal inferences.

Future multicentric and postimplementation studies using mixed methods approaches, including qualitative focus groups alongside objective assessments of clinical and academic performance, are needed to examine students' lived experiences and ongoing challenges under fully implemented EMI. Such studies could investigate the effectiveness of CLIL-informed approaches and assess the potential value of CLT-informed instructional design in authentic clinical learning environments. To optimize EMI implementation, these studies could also evaluate transitional bilingual models while Morocco progressively generalizes English instruction. This evidence would help institutions design targeted curricular support that integrates language development with medical learning.

Conclusions

Students reported high levels of anticipated pedagogical and resource needs, with no statistically significant differences across stages of clinical training. Regular medical and academic English courses were the most highly endorsed forms of institutional support. Students also favored a bilingual French-English training, the translation of concepts, and the use of French in class, whereas mandatory English certification received limited support. These findings indicate that students reported anticipated needs for language and learning support in relation to potential EMI implementation.

Public faculties may benefit from considering integrated approaches, such as CLIL and pedagogical translanguaging, as potential approaches relevant to the reported pedagogical and resource needs. However, the effectiveness of these approaches in this setting requires prospective evaluation. The reported needs may inform the prospective planning and evaluation of sustained language and learning support throughout the clinical curriculum.

Although this single-center study reflects students' perceived needs at a single point in time within a Moroccan public medical faculty, it may offer context-specific insights for other non-Anglophone, resource-constrained medical education settings considering EMI implementation. As this was a preimplementation needs assessment, these findings reflect anticipated rather than lived needs. Any future EMI implementation should be gradual, adequately resourced, responsive to local needs, and prospectively evaluated.

These findings provide preliminary, preimplementation evidence to inform EMI planning at FMPR. They should not be interpreted as evidence of operational challenges, cognitive load, or intervention effectiveness in an implemented EMI curriculum. Postimplementation and longitudinal studies are needed to assess students' lived experiences, learning outcomes, and the effectiveness of institutional support measures.

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Generative AI Use

The authors used generative AI tools, that is, ChatGPT and Perplexity, solely for the purpose of language editing, proofreading, and improving the fluency of the English text. All scientific content, data, and conclusions are entirely the original work of the authors, who take full responsibility for the integrity of the manuscript.

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Data Availability

The datasets generated and analyzed during the current study are not publicly available because they consist of research data collected from students within a single institutional context under conditions of anonymity and restricted use. Deidentified data may be made available from the corresponding author upon reasonable request, subject to institutional approval and ethical considerations.

Authors' Contributions

Conceptualization: IM
Data curation: IM
Formal analysis: IM, ZZ
Investigation: IM
Methodology: IM, IZ
Project administration: IM
Resources: IM
Software: IM, ZZ
Supervision: RR, RA

Validation: IM, ZZ
Visualization: IM
Writing – original draft: IM
Writing – review & editing: IM, RR, IZ, DL, MO, JB, RA

Conflicts of Interest

None declared.

Multimedia Appendix 1

Study questionnaire (English version).
[DOCX File (Microsoft Word File), 23 KB-Multimedia Appendix 1]

Multimedia Appendix 2

Study questionnaire (French version).
[DOCX File (Microsoft Word File), 25 KB-Multimedia Appendix 2]

Checklist 1

STROBE checklist.
[DOCX File (Microsoft Word File), 29 KB-Checklist 1]

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Abbreviations

BICS: basic interpersonal communicative skills
CALP: cognitive academic language proficiency
CERB: Ethics Committee for Biomedical Research
CLIL: content and language integrated learning
CLILMED: CLIL in Medical Education
CLT: cognitive load theory
EMI: English-medium instruction
FMPR: Faculty of Medicine and Pharmacy of Rabat
IELTS: : International English Language Testing System
KMO: Kaiser-Meyer-Olkin
STROBE: Strengthening the Reporting of Observational Studies in Epidemiology
TOEFL: : Test of English as a Foreign Language
UM6SS: Mohammed VI University of Health Sciences

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