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Mentorship in surgical training; a systematic scoping review to inform a mentorship framework for ophthalmology trainees

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Abstract

Background Mentorship plays a vital role in surgical training. In the field of ophthalmology, effective mentorship is particularly critical due to the specialised nature of surgeries and the need for comprehensive skill development. However, the landscape of mentorship remains underexplored. Understanding key characteristics and components of effective mentorship is essential for optimising training and ensuring the success of future generations of surgeons. This scoping review aims to analyse existing literature on mentorship in surgical training and to employ Levac et al.'s enhanced methodological framework to construct a conceptual framework for a bespoke mentorship programme tailored to the needs of ophthalmology trainees.

Methods The search strategy adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines and included relevant databases such as MEDLINE, Scopus, CINAHL Complete, ERIC, EMBASE, and the Cochrane Library. Selection criteria encompassed studies exploring mentorship experiences, perceptions, and outcomes across all surgical training domains. A two-step screening process was employed, followed by thematic analysis using Braun and Clarke's approach. The Medical Education Research Study Quality Instrument (MERSQI) assessed study quality.

Results Of the 81 identified articles, 24 were included in the review, with an average MERSQI score of 11.65. Studies comprised randomised controlled trials, systematic reviews, cohort, cross-sectional studies, and reviews. The thematic analysis identified five domains: (1) mentorship and burnout; (2) surgical skill and performance; (3) career paths and professional development; (4) diversity promotion; and (5) work-life balance.

Conclusions This review underscores the significance of mentorship in surgical training and proposes a conceptual framework tailored to ophthalmology trainees. By synthesising existing literature and through author engagement with relevant training bodies, the study contributes to the development of an imminent mentoring programme, aiming to enhance surgical training outcomes and foster trainee well-being and professional growth.

Keywords Mentorship, Surgical training, Medical education, Conceptual framework, Professional development, Health & well-being, Burnout, Ophthalmology

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Background

Mentorship plays a pivotal role in fostering professional growth and success. However, the authors are aware of the absence of a structured ophthalmology mentorship programme in Ireland. While sporadic informal guidance from senior colleagues exists, the lack of a designated mentorship framework is evident. The Royal College of Surgeons in Ireland (RCSI) had plans to implement a mentorship programme for all surgical trainees in July 2020, but this has not yet been established [1, 2]. There are mentoring programmes in existence for certain surgical specialties in Ireland that have been implemented independently. Trauma and Orthopaedics has implemented a mentorship programme, but information regarding the effectiveness of the initiative to date is lacking [3].

The etymology of the word ‘mentor’ dates back to Greek mythology. Mentor, as depicted in Homer’s *Odyssey*, served as seasoned advisor to Ulysses and assumed responsibility for educating Ulysses’ son, Telemachus, throughout the Trojan War [4]. During Ulysses’ absence, Mentor imparted sagacious counsel to Telemachus, and with the help of the goddess Athena, aided him in making judicious decisions to maintain control over the kingdom of Ithaca.

In contemporary times, a mentor transcends the role of supervisor, embodying an experienced and skilled advisor. This mentor plays a pivotal role in guiding individuals as they navigate their career trajectories and promotes the development of their professional competencies, as well as their personal growth. This transformative relationship is particularly critical in surgical education, extending beyond clinical proficiency to encompass holistic mentee development.

The development of expertise is something that is often talked about in health professions education. Daniel Kahneman and Gary Klein talk about intuition and the acquisition of necessary skills in learning [5]. They assert that emotional learning, such as the development of an aversion or fear to something can be developed quickly. However, the acquisition of expertise usually takes a long time to develop. Bransford talks about the expert’s ability to recognise patterns and the ability to draw on a vast amount of previous experiences to assist them in making decisions [6]. Ericsson talks about mastery in specific fields, and the need for at least 10,000 hours of practice in order to achieve that mastery [7]. However, he makes an important distinction and claims that deliberate practice, using expert coaching in addition to purposeful practice methods, is required in order to achieve this mastery status. This is where mentorship and lived experiences can facilitate learning.

The unique characteristics of the surgical environment, necessitate mentors who not only impart technical skills

but also nurture the fundamental values intrinsic to medical practice. Within this context, the expectations and personalities of surgical staff, combined with the inherent stresses of the surgical domain, create a formidable learning environment for trainees across diverse disciplines.

Building on the seminal work of David Levinson, mentorship, as conceptualised in this scoping systematic review, is a dynamic and reciprocal relationship integral to individual development [8]. Levinson’s model envisions mentorship succeeding when a senior, knowledgeable mentor actively embodies the roles of teacher, model, advisor, and sponsor. Aligning with this perspective, this review adopts a working definition of mentorship as a two-way relationship and a form of human development. It involves a committed investment of personal knowledge, energy, and time by one individual to facilitate the growth, development, and ultimate success of another within the realm of surgical education [9].

Embarking on this systematic scoping review, recognising the need for a nuanced understanding of the qualitative evidence surrounding mentorship in surgical training was crucial. Following the principles laid out by interpretive systematic reviews, the aim was to move beyond the mere summarisation of data and to delve into a comprehensive analysis seeking insights to contribute to the formulation of new theories and frameworks. The interpretive approach chosen for this review aligns with the evolving landscape of systematic scoping reviews, encouraging a deeper exploration of meanings and contexts inherent in mentorship experiences.

Leveraging methodologies such as meta-ethnography, critical interpretive synthesis, and narrative synthesis, the authors sought to uncover insights to inform the development of a theoretical framework specific to mentorship in ophthalmology. In doing so, the aim is to contribute to the advancement of mentorship dynamics, thereby enhancing the comprehension and application of mentorship principles within this specialised field of surgical training.

Methods

Levac et al.’s enhanced methodological framework was used to guide the systematic scoping review [10]. This stage-wise framework is composed of five main categories; identifying the research question, identifying relevant studies, selecting studies to be included in the review, charting the data, and collating, summarising and reporting results. Sarah J Tracy’s model, “Qualitative Quality: Eight ‘Big-Tent’ Criteria for Excellent Qualitative Research”, provides a comprehensive framework that distinguishes among qualitative research’s means and ends [11]. This served as a valuable pedagogical guide, providing a common language of qualitative best practices and

allowing for dialogue, imagination, and growth throughout the research process.

The focus of this review at the outset was to employ the “PCC” (Population, Concept, Context) mnemonic to construct a clear and meaningful title and subsequent research question (Table 1). The main research questions were; what are the key characteristics and components of effective mentorship programmes in surgical training, and can a conceptualised framework for the ideal programme for ophthalmology trainees be implemented? Staff at RCSI and the Irish College of Ophthalmology (ICO), were consulted for input regarding the relative importance and feasibility of implementing a framework. It is hoped that the input gained from these consultations will inform the development of an imminent mentoring programme for ophthalmology trainees in Ireland.

This study directs its attention specifically toward literature addressing mentorship practices within the domain of surgical mentoring. The authors acknowledged that scoping reviews are iterative and were open to refining the research question based on emerging findings.

Identifying relevant studies

The search was conducted according to Preferred Reporting Items for Systematic Reviews and Meta-Analyses statement (Fig. 1).

The medical subject heading (MeSH) terms used were: “((((mentorship) AND (mentoring)) AND (surgical training)) AND (residency))”. Specified filters included; availability of the abstract; full text; publication within the last 10 years; English language; and exclusion of preprints, letters, lectures, editorials, opinions, and commentaries. The following databases were consulted: MEDLINE (through PubMed), Scopus, CINAHL Complete, ERIC (through EBSCOhost), EMBASE, and the Cochrane library. The search in the databases was developed from the 29th of November 2023 until April 18th 2024. In addition, the reference lists of the papers that were included were reviewed, searching for all possibly relevant papers.

Selecting studies to be included in the review

Studies were included that explored mentorship experiences, perceptions, and outcomes across all domains of surgical training. Articles regarding mentorship of medical students and peer-to-peer mentorship were

excluded. Tele-mentoring and distance virtual mentoring were excluded, whereas simulation-based and virtual reality-based mentoring were retained where applicable. Studies were excluded if their abstract did not specifically describe mentorship in surgical training or if they provided insufficient detail for evaluating surgical mentorship. Additionally, mentorship models specific to alternative healthcare fields, such as undergraduate medical training, psychology, and nursing, were excluded. The review also excluded interventions and programmes targeting diversity in training, where they didn’t specifically have a focus on mentoring. A two-step screening process was employed: title and abstract screening followed by full-text review.

Charting the data

Braun and Clarke’s inductive thematic analysis approach was implemented [12]. This began with familiarisation of the data, and then identifying, reviewing and defining separate themes. By performing thematic analysis, the aim was to systematically identify and analyse themes emerging from the data, facilitating higher-order abstraction and theory development. The authors continuously engaged in team meetings to triangulate findings. Triangulation enhances external validity and improves the objectivity within this approach. This collaborative approach ensured that the results accurately and comprehensively represented the nuances of the original data.

The synthesis unfolded through a bipartite process: firstly, intuitive and open coding of primary study findings; and secondly, the clustering of these codes into cohesive areas to shape descriptive and analytical themes. The identified codes were then grouped into five broad themes relating to mentorship in surgical training (Table 2).

Collating, summarising, and reporting the results

The PRISMA extension for scoping reviews (PRISMA-ScR) was used to guide the reporting of the review [13]. The following information was extracted from each article: study type, surgical discipline, and theme(s) addressed. The inclusion of first order constructs (trainees’ quotes) where available, and second order constructs (researcher interpretation, assumptions and ideas) during the data synthesis process allowed for viewing and working with the raw data as well as the authors’ interpretations, which helped ensure the review findings are grounded in the experiences of the participants [14]. The Medical Education Research Study Quality Instrument (MERSQI) was used to assess the quality of studies included in the review [15]. The MERSQI is a validated tool specifically designed for assessing the methodological quality of medical education research studies. It consists of ten items grouped into six domains, including

Table 1 PCC framework used to structure research question

Population	Concept	Context
Surgical trainees and residents	Definition of mentorship in surgical training	Current landscape of mentorship in surgical training
	Models of surgical mentorship	Challenges and opportunities in surgical training
	Outcomes of surgical mentorship	Existing mentorship programmes

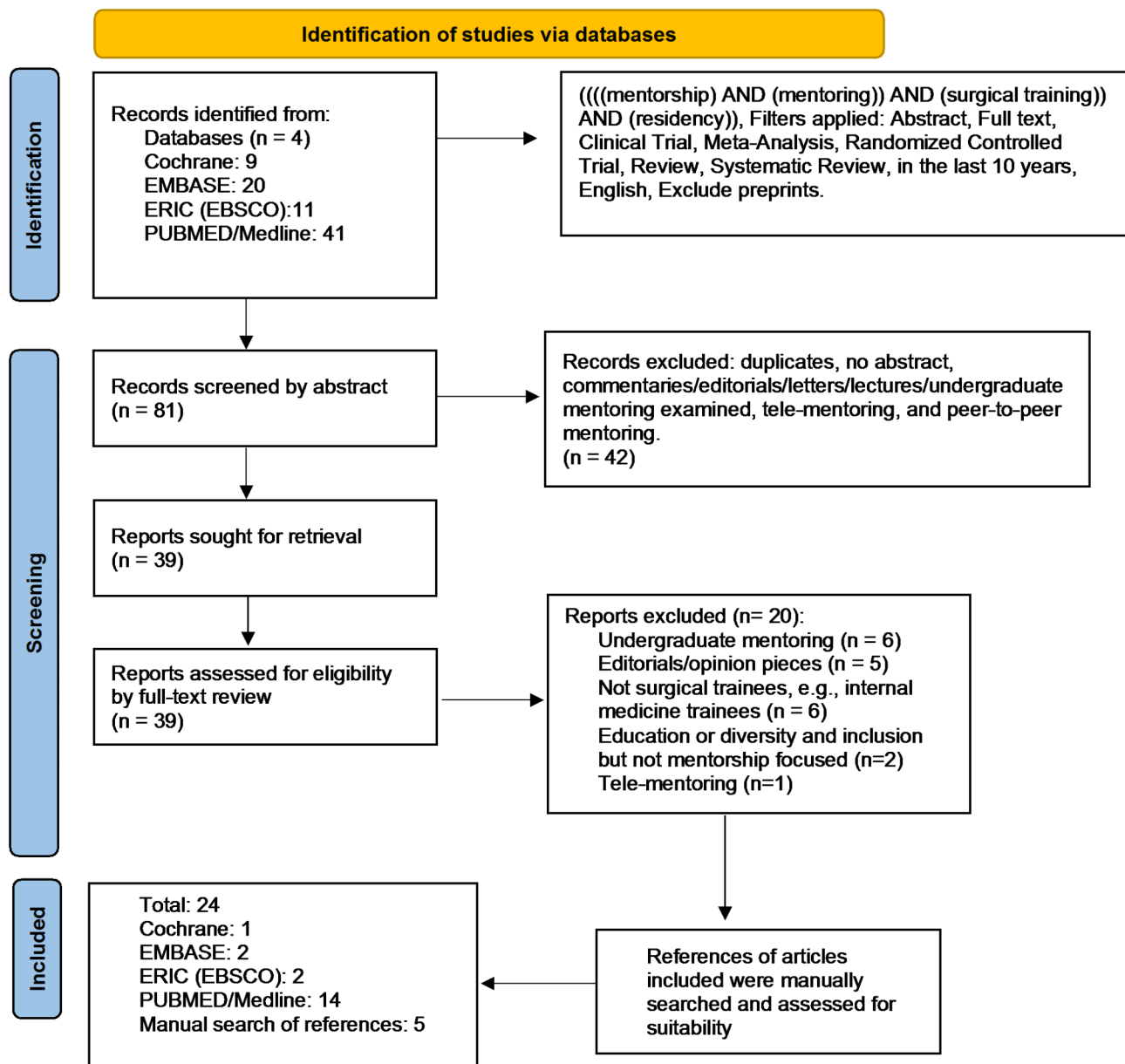


Fig. 1 PRISMA flow chart

Table 2 Themes identified for analysis

Descriptive and analytical themes identified for analysis

1. Mentorship and its role in addressing burnout and well-being.
2. The impact of mentorship on surgical skill and performance.
3. The impact of mentorship on career paths and professional development.
4. Mentorship and its role in promoting diversity.
5. The impact of mentorship on balancing personal and professional priorities.

study design, sampling, type of data, validity of evaluation instrument, data analysis, and outcomes. All domains have the same maximum score of three; maximum score is 18.

Results

Eighty-one articles were identified from the databases and thirty-nine articles were retrieved for full-text review. Twenty-four articles were included in this scoping review.

The average MERSQI score for included studies was 11.65 (range 5–17) and the surgical disciplines specifically addressed are outlined below (Table 3).

Two studies were randomised controlled trials [16, 17], one study was a systematic review [18], one study was a cohort study [19], eleven studies were cross-sectional in nature [20–30], and nine studies were reviews [31–39].

Table 3 MERSQI rating and surgical discipline for studies included in the review

Authors	MERSQI rating	Surgical discipline
Bingmer et al.	14	General surgery
Bonrath et al.	14	General surgery
Chen et al.	10.5	Urology
Cogbill & Shapiro	8	Surgery in general
Enson et al.	12.5	Orthopaedic surgery
Francesca Monn et al.	14.5	Paediatric urology, colorectal surgery
Franzblau et al.	6	Plastic surgery
Han et al.	15.5	Otolaryngology - Head & Neck Surgery
Hart et al.	14	Orthopaedic surgery
Hupp & Halpern	6	Surgery in general
Kibbe et al.	14	General surgery
Lee & Lee	14.5	General surgery
Lefebvre & Shore	11.5	Obstetrics and gynaecology
Liang et al.	15.5	Obstetrics and gynaecology
Louie et al.	8	Surgery in general
Myers et al.	13.5	General surgery
O'Sullivan et al.	13	General surgery
Rashid et al.	5	Surgery in general
Shen et al.	9.5	General surgery
Sinclair et al.	13	Surgery in general
Smeds et al.	14	Vascular surgery
Steelman et al.	8	Surgery in general
Stephens et al.	14	Cardiothoracic surgery
Teshome & Kuerer	8	Breast surgery

The five themes or domains that were identified during the inductive thematic approach were examined further (Table 4). The first theme was specifically addressed in twelve studies, the second in sixteen studies, the third in nineteen studies, the fourth in 9 studies, and the fifth in fifteen studies.

Discussion

Mentorship facilitates critical reflection and learning from experience, thereby reducing the novice-expert gap. Eraut believes that most human learning does not happen in a formal context [40]. The issue with non-formal learning is making the tacit or implicit knowledge explicit. Implicit learning is difficult to attain without prolonged observation, but reactive learning and some deliberative learning are unlikely to be consciously recalled unless in the event of an unusually dramatic outcome. In order for experience to be educational it has to exist symbiotically with critical analysis. In order for critical analysis to be successful, it is crucial to have the assistance of a mentor to guide this process. After all, improvement in performance is dependent on feedback and being able to examine and address certain explicit features of why we do what we do.

Table 4 Theme(s) addressed in each study

Authors	Theme number addressed
Bingmer et al.	1, 4, 5
Bonrath et al.	2, 3
Chen et al.	1, 2, 3, 4, 5
Cogbill & Shapiro	1, 2, 3, 5
Enson et al.	2, 3, 4
Francesca Monn et al.	2
Franzblau et al.	3, 4
Han et al.	1, 5
Hart et al.	3, 5
Hupp & Halpern	1, 2, 5
Kibbe et al.	1, 4
Lee & Lee	2, 3
Lefebvre & Shore	2, 5
Liang et al.	1, 2, 3,
Louie et al.	1, 2, 3, 5
Myers et al.	3, 4, 5
O'Sullivan et al.	1, 3
Rashid et al.	3, 4, 5
Shen et al.	1, 3, 4, 5
Sinclair et al.	2, 3, 5
Smeds et al.	1, 2, 3, 5
Steelman et al.	2, 3, 5
Stephens et al.	2, 3, 4
Teshome & Kuerer	1, 2, 3, 5

Traditionally, training programmes have relied on the preceptorship model, which is often referred to as 'see one, do one, teach one' [41]. This model of learning is related to the social learning theory proposed by Bandura in 1977 [42]. This theory stresses the importance of observational learning, imitation, and modelling in the process of learning. A preceptorship model can be effectively implemented in centres with experienced surgeons available to provide assistance in the operating room, and logistical challenges are minimal in such settings. This is true for procedures that are performed frequently and ubiquitously like cataract surgery. However, specialities with very subspecialised fields within their own realm like ophthalmology, often have only one or two people within a centre or country capable of performing a particular type of surgery. To scale up the exposure rates of these procedures to trainees, the exploration of a national mentorship programme is warranted. Indeed, the ophthalmic surgery training programme in Ireland currently is that of a national model, with trainees moving around the country during their seven years of training. However, those with a subspeciality interest in areas such as orbital surgery, may only actually get to practice in their subspecialty of choice for six months, if at all.

The ICO oversees postgraduate specialist medical education and training in ophthalmology. The ICO is the Medical Council accredited body to deliver the National Training Programme (NTP) in medical and in

conjunction with the RCSI, surgical ophthalmology. The ICO establishes the governance, structure, and standards for postgraduate education, training, and assessment in the field.

The development of a national initiative that allows trainees to identify a subspecialty area of interest earlier on in their training, after completion of three or four years of training, may allow for a more targeted and designated training experience. This may involve trainees travelling to areas where appropriately skilled preceptors are available more frequently or out of hours. Incentives and supports for trainees would be essential for the success of such a programme, as relying solely on professional gratification for skill advancement may not be sufficient.

The designation of a single mentor does not mean that trainees should not learn and extract knowledge from others. It is also important for trainees to have exposure to numerous experienced surgeons during their training, and not to restrict their learnings to the teachings of one trainer. Working with a myriad of characters and surgeons helps develop conditionalised knowledge and allows trainees to draw on each learning experience. This encourages reflection and ultimately helps trainees form their own professional identity, as described by Epstein [43].

Brookfield talks about engaging in critical reflection by examining experiences through various lenses in his article, *Against Naive Romanticism* [44]. One of the lenses that Brookfield examines, our colleagues' experiences, helps us obtain a more rounded view on situations and considers other relevant stakeholder's learnings or interpretations. Critical reflection is ultimately a collective venture, even if it starts out as a solo endeavour. Brookfield refers to Myles Horton's recognition of the importance of using each other as critical mirrors [45]. This cumulative process allows for the re-framing of opinions that may have been formed through experiences and can affirm other practices that may have been learned but that trainees are not confident about performing. Within the field of surgery, this shared conversation with mentors is one of the most crucial learning methods [46]. It serves also as a 'debrief' and a chance to openly discuss concerns that trainees have with certain events. This can help with the emotional conflicts that exist in the quotidian struggles of surgical practice.

Up until this point, the synthesis closely aligned with the original findings extracted from the included studies. However, the synthesis did not directly address the primary concern of the review, namely, the formulation of a mentorship framework tailored to ophthalmology trainees based on the key characteristics and components of effective mentorship programmes in surgical training that were identified through the research question.

In addition to the thematic analysis, integration of principles from educational theories to enrich the qualitative research approach was employed. One such theory utilised to enhance the synthesis was constructivism, which posits that learners construct knowledge and understanding based on their experiences and interactions. By applying a constructivist lens, the aim is to deepen understanding of mentorship dynamics and the learning process among surgical trainees.

The process of "going beyond" the content of the original studies necessitated judgment and insight. The idea of going beyond the data of the original studies is noted by some as the defining characteristic of synthesis [47]. Drawing inspiration from meta-ethnography, particularly the concept of developing 'third-order interpretations', the authors sought to transcend the literal interpretation of study findings. This involved using the descriptive themes derived from the inductive analysis to address emerging questions and concerns throughout the study.

The authors extrapolated barriers and facilitators from researchers' perspectives on mentorship, as reflected in the descriptive themes. Subsequently, there was deliberation on the implications of these perspectives for the development of the mentorship framework. Through this process, identification of more abstract and analytical themes were brought forward that informed the conceptualisation of the mentorship framework.

Based on the analytical and descriptive themes presented in the review, these are the third-order interpretations extrapolated:

1. Mentorship as a protective factor against burnout: mentorship programmes play a crucial role in mitigating burnout and promoting well-being among surgical trainees [17, 20, 22, 24, 26, 27, 29, 31, 32, 34, 36, 39]. Through personalised guidance and support, mentors help trainees navigate the challenges of surgical training, fostering resilience and preventing burnout. By addressing psychosocial stressors and providing emotional support, mentors contribute to a positive learning environment that promotes trainee well-being and reduces attrition rates.
2. Mentorship as a catalyst for surgical skill development: mentorship extends beyond clinical knowledge to encompass surgical skill development and performance improvement [16–19, 21, 28–32, 34–36, 38, 39]. Through direct observation, feedback, and skills coaching, mentors facilitate the acquisition of technical proficiency, thereby reducing technical errors and enhancing self-assessment skills among trainees. Mentorship programmes that prioritise hands-on training and deliberate practice contribute to accelerated skill acquisition and mastery in surgical trainees. Programmes that can uniquely

tailor training experiences to the desires of the trainee, may also hasten the time to mastery within their preferred sub-specialty.

3. Mentorship as a driver of career advancement: mentorship significantly influences the career trajectories and professional development of surgical trainees [16–19, 23, 25–33, 36–39]. By providing career guidance, networking opportunities, and advocacy support, mentors empower trainees to make informed decisions about their specialty choices and pursue their professional goals. Mentorship programmes that emphasise mentor-mentee alignment and longitudinal relationships foster mentorship continuity, enabling sustained career mentorship throughout trainees' professional journeys.
4. Mentorship as a catalyst for diversity and inclusion: mentorship programmes play a critical role in promoting diversity and inclusion within the surgical field [18, 20, 24, 25, 27, 30, 31, 33, 37]. By addressing systemic barriers and biases, mentors advocate for the advancement of women and ethnic minorities in surgery, fostering a culture of inclusivity and equity. Mentorship initiatives that prioritise mentorship diversity and cultural competence enhance mentor-mentee relationships and create pathways for underrepresented groups to thrive in surgical careers.
5. Mentorship as a supportive framework for work-life balance: mentorship programmes contribute to the holistic support of surgical trainees by addressing the balance between personal and professional priorities [20, 22, 23, 25, 27–29, 31, 32, 34–39]. Through mentorship, trainees receive guidance on navigating work-life challenges, managing stress, and maintaining well-being. Mentorship initiatives that incorporate mentorship coaching and wellness activities promote self-care and resilience, enabling trainees to achieve optimal performance while prioritising their personal responsibilities.

These interpretations underscore the diverse effects of mentorship on surgical training and emphasise the significance of meticulously designed programmes in nurturing overall success. These insights were used to help inform the construction of the conceptualised framework and to examine aspects of the programme where there might be barriers to its implementation.

Burnout

The demanding and high-stress nature of surgical training and practice can predispose individuals to burnout, negatively impacting their mental health, job satisfaction, and patient care outcomes [20]. Drawing upon theories

of occupational stress and resilience, it is evident that burnout in surgery stems from factors such as long work hours, high workload, and limited autonomy, highlighting the need for targeted interventions [22, 27]. Mentorship programmes that prioritise holistic support, stress management techniques, and self-care strategies can play a pivotal role in mitigating burnout among surgical trainees [39]. By fostering supportive mentor-mentee relationships, providing guidance on workload management, and promoting work-life balance, mentors can help trainees navigate the challenges of surgical training more effectively. Additionally, institutional initiatives such as wellness programmes, flexible scheduling, and peer support networks can complement mentorship efforts in promoting well-being and resilience among surgical trainees [48]. By adopting a comprehensive approach that integrates mentorship, institutional support, and individual coping strategies, surgical training programmes can create a healthier and more sustainable environment for trainees, ultimately enhancing their overall quality of life and professional satisfaction.

Transformative learning, peak performance, and flow

There is a role for trainees to engage in self-directed learning through simulation and e-learning modules before participating in live surgeries. Simulation training is currently a small aspect of the Irish ophthalmology training programme but there are numerous opportunities for this to be expanded upon to optimise surgeon performance prior to entering the theatre setting. The EyeSi Surgical Simulator (VRmagic, Mannheim, Germany) is the most commonly used simulator worldwide for training aspiring surgeons in cataract surgery. There is only one EyeSi simulator available for use in Ireland and there are no formal teaching classes or programmes in place to help guide trainees. Various training modalities, including cognitive training, cadaveric lab courses, and virtual reality simulators, have been shown to be beneficial for resident training [19, 49]. The integration of preceptorship with these modalities could enhance the learning experience and potentially reduce the number of live cases required to achieve proficiency. The importance of providing opportunities for trainees to reflect and to integrate new experiences and knowledge is based on the model of Transformative Learning [50].

Any framework that aims to improve skill and proficiency should strive to have the trainee achieve their peak performance. Flow, as a concept in peak performance, as described by Csikszentmihalyi, is a state of full engagement, control, concentration, and action awareness that occurs during an activity perceived as highly rewarding [51]. Strategies for fostering flow include defining clear goals, providing unambiguous feedback, creating an immersive learning environment to distort

time perception, encouraging a culture of experimentation and a loss of self-consciousness, and balancing challenges with skills. Providing opportunities for trainees to engage in challenging tasks that require their full attention, helps them enter a state of flow where they lose track of time and become completely absorbed in their activities. Promoting an environment where trainees feel comfortable taking risks and making mistakes without fear of judgment will encourage open communication and create a supportive atmosphere where trainees feel empowered to explore new ideas and approaches without worrying about how they will be perceived by others. Incorporating these tactics can help trainees achieve peak performance.

Surgical proficiency and success of mentorship programmes

Defining surgical proficiency, particularly in post-registration ophthalmology where certified surgeons are acquiring new skill sets all the time, remains a challenge. This is very true for the subspeciality area of glaucoma, which has seen a huge increase in the use of new devices within the domain of micro-invasive glaucoma surgery (MIGS). While some training programmes may have developed competency assessments, their applicability to post-registration surgeons is unclear. In most instances, devices are used after training in 'dry-labs' or after training by drug company representatives selling the devices. Assessment tools such as global rating scales with external governance could contribute to defining an endpoint for preceptorship and assessing surgical competence.

It can also be difficult to measure the success of a mentoring relationship. Specific measures for assessing successful mentorship might involve mentors transferring their responsibilities to their mentees. One trainee in the study by Myers et al. reported that "when your mentor starts directing other people toward you to work with [it's an] indication that they trust you and what you are doing. they want to see you expand your skills and become a mentor yourself. If a mentor does that for you, it is an indication of how that relationship is going" [25]. Other trainees felt that "one of the things that really makes [mentorship] successful is when there is an end product" such as a publication or presentation.

Diversity

Diversity in mentorship within surgical training is essential for cultivating inclusivity, equity, and excellence in the field. Ranging from orthopaedic to plastic surgery disciplines, it is evident that mentorship relationships that reflect the diversity of trainees' backgrounds and experiences can offer unique perspectives, support systems, and role modelling opportunities [18, 33]. Specifically, for female gender and ethnic minority groups,

having mentors who share similar identities can provide validation, affirmation, and a sense of belonging in a historically male-dominated and homogeneous field. Additionally, diverse mentorship teams can help mitigate the barriers and biases faced by underrepresented groups, offering tailored guidance, advocacy, and opportunities for advancement.

Training of mentors

The lack of established training programmes for mentors is a significant challenge in the field of surgery. This absence contributes to the shortage of qualified mentors, which has been identified as a barrier in approximately half of the studies investigating mentorship in surgical training [52]. Mentors ideally should be equipped with the necessary skills and competencies to support their mentees effectively [53]. Currently, there is limited provision for mentorship training within surgical education, with only isolated local projects in the UK and Ireland addressing this need.

Addressing the shortage of qualified mentors and the lack of mentorship training programmes requires a concerted effort from surgical education institutions, professional organisations, and policymakers. These programmes should cover areas such as effective communication, feedback delivery, goal setting, conflict resolution, and cultural competence in mentorship.

Additionally, efforts should be made to raise awareness among surgeons about the importance of mentorship and the benefits of becoming a mentor. Providing incentives, recognition, and support for surgeons who take on mentorship roles can help to incentivise mentorship participation and address the shortage of qualified mentors.

With this in mind, introducing a conceptualised framework for mentoring involves addressing the barriers outlined by Wilson, which can impede the successful implementation of such a programme [54]. He posits that cultivating a culture that promotes seeking help is paramount, as mentorship programmes should strive to create an environment where both faculty and trainees feel comfortable seeking assistance when needed. Additionally, addressing time constraints is essential, and institutions should prioritise allocating dedicated time for mentors to meet with their learners, recognising the importance of mentorship activities. Providing resources to support mentorship is crucial, as mentors may require access to a variety of tools and training materials to enhance their mentoring skills effectively. Finally, securing institutional support is vital, as visible support from faculty in positions of authority helps convey the programme's importance and ensures its formalisation within surgical training institutions.

In forming a conceptualised framework, it is imperative to draw upon existing literature and theoretical

models. The 10 stages of mentorship, as described by Mendler and expanded upon by Pellegrini, provide a roadmap for both mentors and mentees to navigate the mentorship relationship [55, 56]. These stages include establishing rapport, setting goals, providing guidance, offering feedback, encouraging reflection, fostering independence, promoting professional development, facilitating networking, supporting transitions, and maintaining the relationship. By incorporating these stages into the framework, it ensures that mentorship relationships are purposeful, dynamic, and focussed on the holistic development of trainees.

Central to the success of any mentorship programme are the traits of a good mentor. According to Rowley, a good mentor possesses six key traits: expertise, accessibility, empathy, encouragement, honesty, and commitment [57]. By emphasising these traits in the framework, it ensures that mentors are equipped with the necessary qualities to effectively mentor trainees. Mentors with negative traits such as arrogance, neglect, exploitation, and overprotection can undermine the mentorship relationship and hinder the development of their mentees [56]. Therefore, the framework will include guidelines for mentors to avoid these negative behaviours and cultivate a supportive and empowering mentorship environment.

Considering all of these insights, the conceptualised framework for mentoring ophthalmology surgery trainees is formed:

1. Needs assessment and goal setting:
 - Conduct a comprehensive needs assessment to identify the specific learning objectives and areas of improvement for each trainee after establishing a rapport. The relationship should be based on mutual respect and understanding.
 - Collaboratively set clear and achievable goals tailored to the individual needs and career aspirations of each trainee. These goals are set to guide the mentorship relationship and focus on the mentee's professional development.
2. Mentor-mentee matching:
 - Match each trainee with a mentor based on their specialty interests, career goals, and learning objectives.
 - Consider factors such as compatibility, expertise, availability, and communication style when making mentor-mentee pairings.
3. Orientation and onboarding:
 - Provide orientation sessions for both mentors and mentees to familiarise them with the goals, expectations, and responsibilities of the mentorship programme.
 - Offer training sessions to prospective mentors on effective communication, feedback delivery, conflict resolution, and cultural competence to enhance mentorship skills.
4. Regular meetings and check-ins:
 - Facilitate regular meetings between mentors and mentees to discuss progress, challenges, and opportunities for growth.
 - Encourage open communication and provide a safe space for mentees to ask questions, seek advice, and share experiences. Feedback should be constructive in nature and be provided to help the mentee identify areas for improvement and celebrate their successes. This aligns with the model of Self-Determination Theory, which posits that feedback that is perceived as supportive and autonomy-enhancing can increase intrinsic motivation [58].
5. Skill development and hands-on training:
 - Provide opportunities for mentees to participate in hands-on training sessions, surgical simulations, and cadaveric labs to enhance their technical skills.
 - Encourage mentees to engage in self-directed learning through educational resources relevant to their specialty interests.
6. Feedback and performance evaluation:
 - Implement a structured feedback mechanism to provide timely and constructive feedback to mentees on their clinical performance, surgical skills, and professional development.
 - Use objective assessment tools and performance metrics to evaluate mentees' progress and identify areas for improvement. The mentor should encourage the mentee to reflect on their experiences, decisions, and learning to enhance self-awareness and growth.
7. Professional development and career guidance:
 - Offer mentorship sessions focussed on career planning, specialty selection, research opportunities, and academic pursuits. The mentor should encourage the mentee to take ownership of their learning and decision-making process, fostering independence and autonomy.

- Facilitate networking opportunities and connections with key stakeholders in the ophthalmic surgery community to support mentees' professional growth and advancement.
8. Psychosocial support and well-being:
 - Provide mentorship support for mentees' psychosocial well-being, stress management, and work-life balance.
 - Create a supportive environment where mentees feel comfortable discussing personal challenges and seeking assistance when needed.
 9. Longitudinal relationship and transition support:
 - Foster longitudinal mentorship relationships that extend beyond the training period to provide ongoing support and guidance throughout mentees' careers.
 - Offer transition support for mentees transitioning from training to fellowship or from fellowship to practice, including mentorship continuity and career transition planning.
 10. Programme evaluation and continuous improvement:
 - Regularly evaluate the mentorship programme's effectiveness through feedback surveys, focus groups, and performance metrics.
 - Use evaluation data to identify areas for improvement and make adjustments to the programme structure, content, and delivery methods as needed.

By implementing this framework, the aim is to foster a culture of excellence, collaboration, and lifelong learning among trainees, mentors, and the broader surgery community. It is hoped this framework will be piloted and validated going forward.

Limitations

Prevailing accounts of the mentoring process lack comprehensiveness and longitudinal data, leading to an overall lack of insight. This limitation is partly attributed to the absence of effective and validated assessment tools for mentoring. Another potential limitation is the risk of unconscious bias during the coding process, which could have impacted the selection and interpretation of data. Despite efforts to maintain objectivity, researchers' perspectives and experiences may have inadvertently influenced the identification and prioritisation of themes. Additionally, the subjective nature of researcher

reflexivity may have introduced bias into the formulation of the conceptualised framework, as personal beliefs and assumptions could have shaped the interpretation of findings. While every effort was made to mitigate these limitations through transparent methodology, it is important to recognise the potential impact of bias and reflexivity on the results. It is essential to recognise the principal goals, support mechanisms, and institutional inclinations, including funding and investment, to address the limitations and enhance the effectiveness of future mentorship initiatives.

Conclusions

Navigating the intricate terrain of surgical education can prove challenging. This scoping systematic review lays the foundation for the formulation of a theoretical framework. The conceptualised framework, aimed at tackling the unique features of ophthalmic surgery, holds promise for enhancing mentorship dynamics and advancing the comprehension and application of mentorship principles. Ultimately, this endeavour contributes to the evolution of mentorship practices, providing a valuable resource for educators, mentors, and trainees alike, and paving the way for a more supportive and enriching surgical training experience. The authors envisage that this framework will be tested, developed, and further adapted to meet the unique demands of various surgical specialities.

Abbreviations

PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
MERSQI	Medical Education Research Study Quality Instrument
PCC	Population, concept, context
MeSH	Medical subject heading
RCSI	Royal College of Surgeons Ireland
ICO	Irish College of Ophthalmology
NTP	National training programme

Supplementary Information

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Supplementary Material 1

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Author contributions

LB performed the initial search after several meetings with project supervisors ME and CC. Meetings after the initial search were conducted between group members to discuss findings. These were held on-line and via email thread. Areas of research interest were identified and recommended at these meetings and the analysis was tailored accordingly. Scoping review tools and methodologies were recommended at these meetings and findings

were triangulated and discussed. LB wrote the initial draft article. Numerous drafts of the article were subsequently constructed and adjustments were recommended by all authors. All authors read and approved the final manuscript.

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Declarations

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