

A scoping review for designing a disability curriculum and its impact for medical students

Développement d'un cursus en matière de handicap et de impact sur les étudiants en médecine : une étude de portée

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Abstract

Background: There is an increasing need for a standardized undergraduate disability curriculum for medical students to better equip students with the proper training, knowledge, and skills to provide holistic care for individuals with disabilities.

Objectives: The aim of this scoping review was to better understand and analyze the current body of literature focusing on best practice for including disability curricula and its impact on undergraduate medical students

Results: Three major components for designing a disability curriculum for undergraduate medical students were obtained from our analysis. The components were: (1) effective teaching strategies, (2) competencies required for disability curriculum, and (3) impact of disability curriculum on medical students.

Conclusions: Current literature revealed that exposing medical students to a disability curriculum impacted their overall perceptions about people with disabilities. This allowed them to develop a sense of understanding towards patients with disabilities during their clinical encounters. The effectiveness of a disability curriculum is dependent on the extent to which these interventions are incorporated into undergraduate medical education.

Résumé

Contexte : On constate un besoin croissant de créer une formation uniforme sur le handicap dans le cadre des études médicales de premier cycle afin de les doter des connaissances et des compétences nécessaires pour prodiguer des soins holistiques aux personnes handicapées.

Objectifs : Le but de cette revue de la portée était de mieux cerner la littérature scientifique décrivant les meilleures pratiques pour l'élaboration d'un programme d'enseignement sur le handicap et les incidences d'un tel programme sur les étudiants en médecine de premier cycle.

Résultats : Nous avons pu dégager trois éléments principaux dont il convient de tenir compte lors de la conception d'un programme d'enseignement sur le handicap au prédoctorat : (1) l'efficacité des stratégies pédagogiques, (2) les compétences à le cadre de la formation sur le handicap, et (3) les incidences de la formation sur les étudiants.

Conclusions : La littérature révèle qu'une formation sur le handicap a des incidences sur la manière générale dont les étudiants en médecine perçoivent les personnes qui en souffrent. Par suite d'une telle formation, les étudiants font davantage preuve de compréhension envers les patients lors de leurs rencontres cliniques. L'efficacité d'une formation sur le handicap dépend du degré de son intégration dans le cursus médical de premier cycle.

Introduction

According to the World Health Organization (WHO), disability is an umbrella term for impairments, limitations, and participation restrictions that may have limited peoples' everyday activities.¹ Hence, for the purpose of this scoping review, we focused on the general concept of disabilities being taught to undergraduate medical students (UME).

During medical school, students should be equipped with the relevant knowledge and skills required to practice as a resident and eventually as a physician. A survey conducted by Symons and colleagues² prior to the implementation of a disability curriculum, showed that 22% of undergraduate medical students lacked the necessary knowledge and comfortability to interact with patients with disabilities and lacked confidence in their skills/training.² After exposure to disability curricula, students reported an increase in their confidence and an improvement in knowledge.² Woodard et al. showed that medical students harbor negative predisposed attitudes and stigma towards people with disabilities mainly because they lack the training needed to provide appropriate care to patients with disabilities.³ A study focusing on physicians' perceptions of implicit bias can contribute to healthcare disparities experienced by patients with disabilities. This is concerning as a study by Lezzoni and colleagues (2021)⁴ demonstrated that students may take their biases with them into their professional careers as practicing physicians. This study found that physicians experienced similar feelings of discomfort and uneasiness during the interaction and treatment of patients with disabilities.⁴

The implementation of a disability curriculum provides the structural framework necessary to ensure medical students are taught to improve their clinical skills, knowledge, their abilities as advocates, as well as their understanding of their patients, and communication skills.^{2,3,5,7} Early and frequent encounters with people with disabilities have been shown to have a positive impact on students' attitudes, and their comfortability to interact with patients.^{2,3,6}

This scoping review builds on what we know from the research focusing on undergraduate disability curriculum by further exploring some of the gaps that exist in the current body of literature.

Currently, research shows that there is an increasing need to better educate medical students to ensure that they are better prepared with the proper training, knowledge, and skills to provide holistic care for individuals with disabilities.

Furthermore, a recent call to action for a systemic change toward disability competent healthcare workforce validates the urgency and highlights a huge gap in this area⁸ A scoping review was undertaken because the research aim of our review was broader in context therefore, making a systematic review methodologically not relevant. The aim of this scoping review was to better understand and analyze the current body of literature focusing on best practice for including disability curricula and its impact on undergraduate medical students with a goal to bring awareness on how to effectively design a disability curriculum.

Methods

Search strategy and databases

A health sciences librarian (LD) conducted searches within Medline (Ovid MEDLINE(R) ALL), Embase (Ovid interface), CINAHL Plus with Full Text (EBSCOhost interface), OpenDissertations (EBSCOhost interface), Proquest Education Database, Canadian Business & Current Affairs Database (Proquest interface), ERIC (Proquest interface), Proquest Theses and Dissertations Global, and Scopus from the inception of the database(s) until January 11, 2021. The search combined synonyms for the following two concepts: medical education and disability curriculum. The search strategy's terms and syntax were optimized for each database. References cited in included papers were manually reviewed for any relevant articles. The full details of the search strategy can be found in the supplementary materials.

Inclusion/exclusion of studies. This scoping review included studies discussing the content of disability related curricula in undergraduate medical programs. The following types of studies were excluded if: (1) the article was published in a language other than English, (2) grey literature, including personal websites and blogs, (3) papers focused on a curriculum about a single disability, and (4) literature on medical education for residents and other health professionals. No restrictions were placed on the study design or publication date. The rationale for the exclusion criteria was due to the following: (1) Other languages were excluded because reviewers did not want to misrepresent or misinterpret literature available in other languages that they were not familiar with, (2) gray literature was excluded because our focus was on peer reviewed scientific studies, (3) as this is a scoping review, we wanted to ensure that the topic of the disability curriculum covered general disabilities rather than single

types of disabilities. Lastly, residents and other health professionals were excluded as our objectives focused on undergraduate medical education (UME). Covidence, a web-based platform for conducting reviews was used for screening. Two reviewers screened articles retrieved from the search based on the title and abstract and then based on the full text. All disagreements were resolved with consensus by the two reviewers.

Charting the data

Charting the data consisted of a table jointly developed by 2 reviewers to ensure the accuracy and consistency of the information being extracted. The data chart table was then filled out by one extractor and subsequently checked for discrepancies by another reviewer.

Data extraction and analysis

Data were extracted and sorted into the following fields: publication information (e.g., authors, year of publication, country), curriculum related to disability, general study characteristics, study objective, participant characteristics, study design and findings (Appendix A, Table 1). Data extraction was done by a single extractor and was assessed by two reviewers to ensure accuracy. All extraction discrepancies were resolved by consensus. In the case of ambiguous or unreported information in the original studies, primary authors were contacted for clarification.

A qualitative inductive thematic analysis was conducted, and detailed findings are presented in summary Appendix A, Tables 1 and 2. All extracted data were read by team members to familiarize themselves with the data. We highlighted relevant categories of information, which were then coded. Data tables were used by two team members to sort the codes into themes. Lastly, data were reviewed

by all team members and any discrepancies were resolved by consensus with findings reported in Appendix A, Tables 1 and 2.

Results

Description of included studies

The database search generated 2354 articles with 1068 left after duplicates were removed. The full texts of 33 articles were retrieved and 20 were included in this scoping review (Figure 1. PRISMA). A total of 20 articles (Table 1) met our inclusion criteria. At the initial stage, articles were excluded based on title and abstract that did not meet our inclusion criteria. During full text review, papers were excluded based on the following reasons: a) papers that were not curriculum focused, for example, papers focusing on experiences of physicians, allied health providers and patients, b) papers that focused on specific types of disabilities such as autism, blindness, or intellectual disabilities. More than 50% of the articles included in this scoping review were published in the United States ($n = 11$). Other studies were conducted in the United Kingdom ($n = 3$), Australia ($n = 3$), Brazil ($n = 1$), Columbia ($n = 1$) and Israel ($n = 1$). Studies used a wide range of methods including quantitative ($n = 7$), qualitative ($n = 5$), mixed methods ($n = 2$), perspective paper ($n = 1$), a systematic review ($n = 1$), letter to the editor ($n = 1$), program evaluation papers ($n = 2$) and a review ($n = 1$). Although the focus of the included studies was on the general concepts of disabilities, the majority of the studies included patients or patient scenarios representing mental, physical, developmental and any disabilities that limited their day-to-day activities.

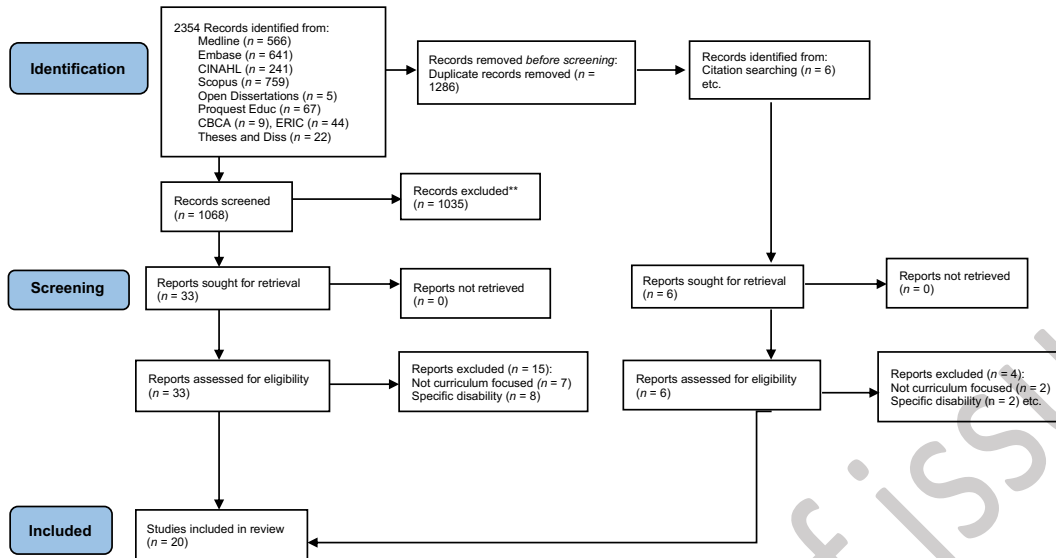


Figure 1. PRISMA 2020 flow diagram for new systematic reviews which included searches of databases, registers, and other sources

Our results were then organized into three major themes for designing a disability curriculum for undergraduate medical students: (1) Effective teaching strategies, (2) competencies required for a disability curriculum, and (3) the impact of a disability curriculum on medical students. Since we utilized qualitative thematic analysis. The findings in this scoping review reported themes that had reached saturation.

Effective teaching strategies

Medical schools incorporated specific teaching strategies to effectively educate medical students about the general concept of disability, its impact on patient care, and the role of physicians in improving care.^{2,7,9} These teaching methods included: presentations,^{2,5,10-16} group sessions,^{5,7,9,11} lectures,⁹⁻¹² videos,^{12,13} workshops,^{6,7} presentations by guest lectures,^{2,5,9-16} online modules,^{2,3,15} and seminars.^{2,5,10} Group discussions and debates were also used in the included studies.^{10,15} These teaching methods allow students to engage in conversations about the concept of disability with other students, which often leads to increased critical thinking.¹⁰ One teaching strategy that was used and endorsed by several included studies was the idea of using patients as educators.^{2,7,13,17} This allowed students to have direct clinical experience with patients similar to those they may treat in the future.^{7,13}

Findings from these studies indicated an improvement in students' mindset towards people with disabilities after exposure to patients as mentors.^{2,12,17} Two studies investigated the effect of home visits and showed that students who observed patients in their own homes

reported an increase in their awareness and knowledge significantly.^{3,13} The students also reported reduced stress when learning from the familial environment of the patients' homes as opposed to the hospital environment.^{3,13} Furthermore, a study conducted by Marshall et al.¹⁷ investigated the effectiveness of hospital-based teaching styles vs. home-based teaching styles for medical students. They found that patients were more comfortable communicating about their disabilities and the impact of their disabilities on their everyday life during the home visits in comparison to when patients were in a hospital setting.

In summary, various teaching strategies were implemented that exposed students to different settings, such as clinical, home, and academic that allowed them to learn from different groups such as patients, preceptors, and their peers.

Competencies required for disability curriculum

Disability curriculum should include training in competencies such as communication, empathy, and a better understanding of patients' needs.^{5,9,11,12,16} Seven studies reported significant improvement in medical students' ability to communicate with people with disabilities after exposure to a disability curriculum.^{2,3,7,9,10,17,18} Good communication skills are essential for effectively delivering appropriate and compassionate care to patients.^{5,19,20} Fourteen studies reported that physicians' knowledge and their ability to understand the way patients feel is vital to patient care.^{3,5,7,9,10,11,12,13,15,17,20-23} In Loerger et al. and Sarmiento

et al., students met patients in real life and discussed their patient's individual struggles.^{6,13} This allowed them to reflect on their attitudes and understanding of the concept of disability. Graham et al. showed that undergraduate medical students who completed a longitudinal educational intervention reported a statistically significant increase ($p = 0.003$) in developing a sense of empathy towards their patients with disabilities which reduced stress and burnout among medical students.^{10,21}

Understanding patients' hardships and day-to-day difficulties contributed to the improvement in the emotional and professional development of medical students.¹² This resulted in changing attitudes about people with disabilities as well as medical students advocating¹³ for their patients and coming up with solutions to mitigate difficulties faced by people with disabilities.^{3,10,15,17} In summary, disability interventions allowed medical students to develop skill sets and competencies such as empathy, improved communication skills, and a better understanding of the care needed for patients with disabilities.

Impact of disability curriculum on medical students

Twelve studies reported that medical students who did not have exposure to any kind of disability curriculum had decreased initial levels of confidence and comfortability with patients with disabilities. However, once these same students were enrolled in a disability curriculum, there was an increase in their confidence, extensive improvement in their comfort, and students reported less awkwardness while interacting with people with disabilities.^{1,2,3,5,6,8,9,10,14,16,17,18} For example, in Graham et al.,¹⁸ the students reported significantly reduced feelings of discomfort (p -value ≤ 0.002) and increased level of comfortability (p -value ≤ 0.0001) after completion of a disability curriculum. Further, exposure to a disability program increased students' confidence to accurately assess and diagnose these patients.³

Medical students initially reported negative attitudes towards patients with a disability; however, completing a disability curriculum led to a significant positive change in medical students' attitudes in thirteen studies.^{2,3,6,9,10,12,13,14,17-21} Furthermore, students reported recognizing the difficulties that people with disabilities face and showed an increased understanding of their contributions to society.^{11,20} Studies also revealed that increased knowledge about people with disabilities correlated with students' decreased predisposed bias.^{2,6,14,15,19,21} For example, Medina-Walpole et al.

reported a statistically significant decrease in pessimism and bias ($p = 0.62$) towards individuals with disabilities.¹⁹ In summary, introducing medical students to a well-developed disability curriculum will lead to increased positive attitudes, reduced levels of bias, and increased comfort while providing care to patients with disabilities.

Discussion

The evidence from this scoping review demonstrates that students' experiences with the disability curricula improved their understanding of the issues surrounding patients with disabilities. Most studies showed that a disability curriculum had a significant positive impact on the overall attitudes and beliefs of undergraduate medical students. The key competencies that should be included in a well-developed disability intervention are comfort with providing care to individuals with a disability, empathy, and better communication skills. In addition, a wider range of teaching strategies was identified and used by medical educators for teaching disability curricula. These teaching strategies consisted of workshops, videos, lectures, home visits, PBL, guest speakers, online activities, etc.

Home-based learning was reported to be the most effective teaching strategy as evident in the findings of our scoping review. Home-based learning was shown to have improved comfortability among patients as well as students. This finding is reflected in the current body of literature which suggests that medical students who were exposed to a patient's home environment reported decreased anxiety compared to students who were only exposed to the clinical environment.¹⁴ Furthermore, current literature also revealed that home-based learning had a profound effect on trainees by allowing them to know their patients outside of the hospital settings.²⁴ Additionally, home-based learning increased their appreciation for caregivers who were involved in the care of people with disabilities at home.²⁴ All this evidence points to the fact that it is vital that medical educators and preceptors use diverse teaching pedagogy for effective content delivery and consider incorporating home based teaching styles as a complementary teaching approach.

Based on the findings from our scoping review when teaching disability curricula, medical educators should keep in mind that they must develop an inclusive and appropriate curriculum that meets the needs of students and their patients with disabilities. Firstly, including patients as mentors is one of the best practices in delivering a disability curriculum. This finding is in line with

existing literature which suggests that such a community engaged approach significantly impacted the quality of knowledge transfer to undergraduate medical students.⁹ This requires medical educators to liaise with community agencies that provide assistance to clients with disabilities. Patients and their family members can be invited as guest lecturers to teach and engage in discussion with learners and share their firsthand experiences as people with disabilities or as caregivers to people with disabilities. Patients with disabilities are the most credible source of information; hence, incorporating patient mentored programs reinforces the credibility of information being shared with trainees. Existing literature revealed that patients with disabilities and their caregivers also play a significant role in increasing relatedness and compassion among medical students.²⁵ By allowing people with disabilities and their family members to become a part of students' education, patients can influence the development of a more diverse and inclusive curriculum. Secondly, findings from our review, revealed that a longitudinal curriculum was deemed most effective for teaching disability content and a better understanding of the type of care needed for individuals with disabilities. Similarly, existing literature suggests that concepts of disability should be structured into long term and ongoing teaching interventions which are crucial for professional practice and beneficial for the development of significant competencies needed to improve care for people with disabilities.^{6,9,10,13}

This review showed that structured assessments including observation and narrative assessment of students' interactions with their peers^{6,13} have not been regularly incorporated into existing interventions to assess their impact. Hence, we suggest that the curriculum should incorporate more structured assessments to regularly measure the impact of the disability curriculum on students' knowledge, attitudes, communication skills, and empathy for people with disabilities. This will help medical educators to better understand their students' needs and allows educators a chance to improvise and improve the curriculum for effective knowledge delivery. A curriculum regarding the general concept of disability is valuable to students as it allows them to gain exposure to patients of various age groups and a wide range of conditions. This is significant in exposing a learner to a comprehensive overview of various disabilities and prepares them to have an understanding of disabilities that they may encounter in clinical settings.

Strengths and limitations

This scoping review has many strengths regarding its methodological rigor. For example, an expert librarian was included in the team and the team worked together to come up with a sensitive search strategy. Included papers were screened and underwent multiple readings by reviewers for inconsistencies and to avoid any errors. However, there is a need to highlight some of the limitations of our review and the included studies. Our review only included English texts which may have resulted in valuable literature being excluded due to the language barrier. Furthermore, given that quality assessment is not part of the methodology protocol for conducting scoping reviews, we were not required to conduct a quality appraisal for the included papers. This may reduce the generalizability of the results. The included studies themselves had serious limitations. Disability curricula were not evaluated rigorously. Only three studies^{3,13,16} used a pre-test/post-test design, and no studies included a control group. Additionally, none of the studies included long term evaluations of the disability curriculum and none of the studies reported extending the curriculum beyond the preclinical years, which could impact long term retention of knowledge and skills.

Conclusion

In this paper, we examined existing literature on disability curriculums designed to help undergraduate medical students develop the knowledge, competencies, and skills required for clinical and academic training. Current literature revealed that exposing medical students to a disability curriculum impacted their overall perceptions of people with disabilities. Exposure to a general disability curriculum allowed students to introspectively reflect on their knowledge and awareness of disabilities which led to students reporting an overall increase in empathy, compassion, and positive attitudes toward patients with disabilities. Lastly, students who participated in a general disability curriculum experienced a decrease in anxiety while providing care to people with disabilities. This allowed them to develop a sense of understanding toward their patients with disabilities during their clinical encounters. The effectiveness of a disability curriculum is dependent on the extent to which these interventions are incorporated into undergraduate medical education. We have included suggestions within this paper as a starting point. This scoping review provides some key points for successfully integrating disability curricula into medical

schools for better quality of care provided to people with disabilities.

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References

- World Health Organization. *WHO global disability action plan 2014-2021*. 2015
<https://www.who.int/publications/i/item/who-global-disability-action-plan-2014-2021>. [Accessed June 7, 2022]
- Symons AB, McGuigan D, Akl EA. A curriculum to teach medical students to care for people with disabilities: development and initial implementation. *BMC Med Educ*. 2009;9:78.
<https://doi.org/10.1186/1472-6920-9-78>
- Woodard LJ, Havercamp SM, Zwygart KK, Perkins EA. An innovative clerkship module focused on patients with disabilities. *Acad Med*. 2012;87:537-542.
<https://doi.org/10.1097/ACM.0b013e318248ed0a>
- Iezzoni LI, Rao SR, Ressler J, et al. Physicians' perceptions of people with disability and their health care. *Health Aff*. 2021;40(2):297-306.
<https://doi.org/10.1377/hlthaff.2020.01452>
- Borowsky H, Morinis L, Garg M. Disability and ableism in medicine: A curriculum for medical students. *MedEdPORTAL*. 2021;17:1-8. https://doi.org/10.15766/mep_2374-8265.11073
- Ioerger M, Flanders RM, French-Lawyer JR, Turk MA. Interventions to teach medical students about disability: a systematic search and review. *Am J Phys Med Rehabil*. 2019;98:577-599.
<https://doi.org/10.1080/14739879.2014.11494239>
- Watmough S, Leftwick P, Alexander-White S. An evaluation of medical students' views on the introduction of a community placement and its impact on their understanding of patients with disabilities. *Educ Prim Care*. 2014;25:36-42.
<https://doi.org/10.1097/ACM.0b013e318248ed0a>
- Bowen CN, Havercamp SM, Karpiak Bowen S, Nye G. A call to action: preparing disability-competent health care workforce. *Disabil Health J*. 2020;13(4):1-5.
<https://doi.org/10.1016/j.dhjo.2020.100941>
- Long-Bellil LM, Robey KL, Graham CL, et al. Teaching medical students about disability: the use of standardized patients. *Acad Med*. 2011;86:1163-1170.
<https://doi.org/10.1097/ACM.0b013e318226b5dc>
- Castro SS, Rowe M, Andrade LF, Cyrino EG. Developing competencies among health professions students related to the care of people with disabilities: a pilot study. *Interface*. 2017;22:551-563. <https://doi.org/10.1590/1807-57622016.0684>
- Crotty M, Finucane P, Ahern M. Teaching medical students about disability and rehabilitation: methods and student feedback. *Med Educ*. 2000;34:659-664.
<https://doi.org/10.1046/j.1365-2923.2000.00621.x>
- Galil A, Glick S, Flusser H, et al. Teaching medical students about disability: A community-based approach. *Med Teach*. 1996;18:333-337.
<https://doi.org/10.3109/01421599609034187>
- Sarmiento C, Miller SR, Chang E, Zazove P, Kumagai AK. From impairment to empowerment: a longitudinal medical school curriculum on disabilities. *Acad Med*. 2016;91:954-957.
<https://doi.org/10.1097/ACM.0000000000000935>
- Symons AB, Morley CP, McGuigan D, Akl EA. A curriculum on care for people with disabilities: effects on medical student self-reported attitudes and comfort level. *Disabil Health J*. 2014;7:88-95. <https://doi.org/10.1016/j.dhjo.2013.08.006>
- Sheppard ME, Vitalone-Raccaro N, Kaari JM, Ajumobi TT. Using a flipped classroom and the perspective of families to teach medical students about children with disabilities and special education. *Disabil Health J*. 2017;10:552-558.
<https://doi.org/10.1016/j.dhjo.2017.03.012>
- Rogers JM, Morris MA, Hook CC, Haver RD. Introduction to disability and health for preclinical medical students: Didactic and disability panel discussion. *MedEdPORTAL*. 2016;12:1-5.
https://doi.org/10.15766/mep_2374-8265.10429
- Marshall J, Haines A, Chamberlain MA. Undergraduate medical education on disability and rehabilitation in the UK. *Clin Rehabil*. 1991;5:251-254.
<https://doi.org/10.1177/026921559100500312>
- Wells TPE, Byron MA, McMullen SHP, Birchall MA. Disability teaching for medical students: disabled people contribute to curriculum development: letters to the editor. *Med Educ*. 2002;36:788-790. <https://doi.org/10.1046/j.1365-2923.2002.01264.1.x>
- Medina-Walpole A, Mooney CJ, Lyness JM, Lambert DR, Lurie SJ. Medical student attitudes toward patients in diverse care settings: the impact of a patient evaluation course. *Teach Learn Med*. 2012;24:117-121.
<https://doi.org/10.1080/10401334.2012.664533>
- Tracy J, Graves P. Medical students and people with disabilities: A teaching unit for medical students exploring the impact of disability on the individual and the family. *Med Teach*. 1996;18:119-124.
<https://doi.org/10.3109/01421599609034145>
- Graham CL, Brown RS, Zhen H, McDermott S. Teaching medical students about disability in family medicine. *Fam Med*. 2009;41:542-544.
- Ankam NS, Bosques G, Sauter C, et al. Competency-based curriculum development to meet the needs of people with disabilities: a call to action. *Acad Med*. 2019;94:781-788.
<https://doi.org/10.1097/ACM.0000000000002686>
- Jones P, Donald M. Teaching medical students about children with disabilities in a rural setting in a school. *BMC Med Educ*. 2007;7:1-5. <https://doi.org/10.1186/1472-6920-7-12>
- Havercamp SM, Macho PN. *What undergraduate and graduate students should know about disability*. In: Rubin IL, Merrick J, Greydanus DE, Patel DR, editors. *Health care for people with intellectual and developmental disabilities across the lifespan*. USA: Springer, Cham; 2016.p.2125-2131.
https://doi.org/10.1007/978-3-319-18096-0_160
- Saketkoo L, Anderson D, Rice J, Rogan A, Lazarus CJ. Effects of a disability awareness and skills training workshop on senior medical students as assessed with self ratings and performance on a standardized patient case. *Teach Learn Med*. 2004;16:345-354. https://doi.org/10.1207/s15328015tlm1604_7

Appendix A. Tables and figures.

Table 1. Summary of included studies (N = 20)

Authors (Year)	Sample size (n)	Country	Study Design	Year of Training	Curriculum Related to Disability
Ankam et al. (2019) ²²	None	USA	Review Paper	First to fourth year	This paper focused on the Association of Academic Physiatrist (AAP) annual meeting in California, where people with disabilities and physicians came together to discuss solutions to develop a curriculum for international agencies such as WHO. The curriculum used case-based learning, patient simulation, and objectively structured clinical examinations.
Borowsky et al. (2021) ⁵	Students (n = 121)	USA	Mixed Methods	First year	A three-week ableism and disability-based curriculum was implemented for students in the form of a twelve-hour seminar, made up of twelve students and one facilitator at the University of California San Francisco School of Medicine (UCSF). Facilitators were given training regarding the social aspects of having a disability. Students were given the opportunity to participate in an eight-week UCSF fellowship summer program following the twelve-hour seminar to implement changes to the current curriculum alongside a facilitator. The twelve-hour session with the group of twelve students was divided into two key components, a thirty-minute group discussion and a forty-minute student presentation. During the thirty-minute group discussion, students deliberated on solutions regarding the stigma and bias that patients with disabilities endure daily. Subsequently, the forty-minute student presentation included key topics related to ableism.
Castro et al. (2017) ¹⁰	Students (n = 12)	Brazil	Qualitative	First to fourth year	This nationwide curriculum consisted of a thirty-hour multidisciplinary course to improve competencies necessary for physicians to provide vital care to people with disabilities. The thirty-hours were divided into four categories: the first eight-hours, focused on the concepts of disabilities and the policies associated with it. The subsequent eight-hours were allocated to the experiences of having a disability, the next eight-hours focused on the clinical experience with a physiotherapist. Additionally, the last six-hours were allocated for seminars, discussions, and debates that included guest lecturers with disabilities to share their experiences with the students.
Crotty et al. (2000) ¹¹	Students (n = 146)	Australia	Quantitative	Third year	The Flinders University of South Australia's introductory course on disabilities allowed students to explore the concepts of rehabilitation and disability within medicine. Students were asked to participate in various activities in a span of four-weeks. Beginning with patient monitoring with the acquisition of knowledge within a rehabilitation setting. Subsequently, students then visited two individuals who were diagnosed with a disability living in the community and evaluated their physical, mental, functional, and social status. Additionally, students were also asked to take part in twenty-seven hours of lectures, which included problem-based learning (PBL).
Galil et al. (1996) ¹²	Students (n = 60)	Israel	Qualitative	First year	At the Child Development Center, programs were introduced which allowed students to acquire clinical disability experience within a hospital setting. This allowed students to interact with individuals with disabilities while simultaneously developing an understanding of complications individuals with disability faced. Students were required to take part in a four-day program which included group discussions regarding the connotation of disability and lectures on common causes of disability. Finally, students presented a thirty-minute presentation summarizing the program and what they learned.
Graham et al. (2009) ²¹	Students (n = 12)	Columbia	Quantitative	Third year	The curricula consisted of a ninety-minute session taught to medicals students during their six-week family medicine clerkship that included describing scenarios that are focused on the various aspects of an individuals' disability, the specifics regarding their conditions and other considerations of their care. Students discussed solutions for patients with disabilities allowing them to gain experience and comfortability in the diagnosing patients' disabilities effectively.

Jones et al. (2007) ²³	Students (n = 26)	Australia	Qualitative	Fourth year	Sixteen students were given the chance to volunteer in groups of three or four to complete the pediatrics' and child health's eight-week placement at Newcastle University. The students were supervised by a general pediatrician at a rural referral hospital, where the students had exposure to outpatient pediatric sessions. Problem based learning and bedside teaching sessions were used to enhance students' clinical experiences. Another major component of this curriculum included four-visits to community with a duration of an hour and a half /per week.
Loerger et al. (2019) ⁶	Articles (n = 77)	USA	Systematic Review	First to fourth year	The authors' coding was based on the curriculum interventions that includes the following four categories: (a) attitudes: evaluating overall feelings and perceptions about people with disabilities; (b) skills: curriculums that assessed how well students could execute skills related to disability e.g.OSCEs; (c) knowledge: curriculums that assessed if the students had enough information about disability; and (d) feedback: any form of evaluation or reported feedback related to students' perceptions of the educational intervention.
Long-Bellil et al. (2011) ⁹	None	USA	Program Evaluation Paper	First to fourth year	This study reported on the different types of programs available for medical trainees, which incorporated the use of standardized patients with disabilities. Furthermore, the paper also discussed how medical school curricula began to incorporate the use of standardized patients which allows students to care for patients more effectively.
Marshall et al. (1991) ¹⁷	None	UK	Perspective Paper	First to fourth year	This perspective paper discussed recommendations for a disability curriculum which could be taught one day a week over the course of two months, with the involvement of healthcare professionals as the educators. Additionally, the authors suggests that the curriculum should also include teaching communication skills, community-based teaching, home visits, and hospital-based teaching in wards. Finally, the curriculum should incorporate more structured assessments to ensure that medical students have better clinical knowledge needed for proper diagnosis.
¹⁹ Medina-Walpole et al. (2012)	Students (n = 194)	USA	Quantitative	First year	Students were required to participate in a ten-week disability curriculum at the University of Rochester School of Medicine and Dentistry. The goal of this curriculum was to improve students' clinical and didactic aspects of treating patients with disabilities. Students were taught sessions by patients with disabilities which improved their clinical knowledge and comfortability in assessing these patients.
Rogers et al. (2016) ¹⁶	Students (n = 10)	USA	Qualitative	First year	A comprehensive disability curriculum was implemented utilizing trained speakers from local disability organizations and participants with various types of disabilities as panelists. The two and a half-hour session were supervised by faculty members followed by a one-hour discussion with community member panelists. Students were divided up into small groups for ten-minutes to discuss general topics on disability, which was followed-up by a small presentation and group discussions.
Sarmiento et al. (2016) ¹³	Students (n = 100)	USA	Quantitative	First and second year	For this curriculum, the teaching strategies consisted of small group sessions, discussions, videos, model patients with disabilities, and social aspects related to disability. Students were also required to take part in the two-year longitudinal project called Family Centered Experience, which improved medical students' communication skills with patients and their families and to promote understanding of patient's experiences. Students had their own individual two-hour group discussions to improve comfortability among themselves. M1 session's (First years) discussed important educational strategies including social and medical aspects of disability and stigma associated with it. M2 session's (Second years) educational strategies include improving social and societal requirements along with an understanding of the hardships faced by these individuals.
Sheppard et al. (2017) ¹⁵	Students (n = 112)	USA	Mixed Methods	Second year	The new curriculum was based on a flipped classroom approach which consists of online modules and panel discussions with parents of children with disabilities. Students were required to study a twenty-slide presentation focusing on special education law, disabilities education act, and

					policies as well as information about the role of physicians in terms of diagnosis, referral, and on-going support. One-week later, five mothers who had children with disabilities participated as panelists to discuss their experiences in a class. Following this discussion students were then given an assignment based on three writing prompts to participate in an online discussion.
Symons et al. (2009) ²	None	USA	Program development and Evaluation Paper	First to fourth year	The authors had defined three general goals for disability curriculums relating to (1) building the required knowledge, (2) instilling the appropriate attitudes, and (3) fostering the needed skills to care for people with disabilities. In this curriculum, both traditional (didactic sessions) and modern teaching techniques (encounters with parents of patients and standardized patients) were implemented. Students also had hands-on clinical experience during their disability curriculum. First-year medical students were given lectures on the topic of disability and its social aspects by individuals from community agencies. Students were also required to participate in small group discussions about the experiences of people with disabilities and their families within the health care system. Second-year medical students were given presentations on clinical aspects of interactions and participated in clinical encounters with people with disabilities. Third-year medical students spent a day in their family medicine clinic to get exposure to the clinical setting. They were involved in didactic presentations that focused on common medical concerns reported by people with disabilities. They also took part in a half-day workshop that focused on the legal and socioeconomic aspects of the care they provided. Lastly, fourth-year students had the option to be involved in a four-week elective on primary care of this patient population.
Symons et al. (2014) ¹⁴	Students (n = 113)	USA	Quantitative	First to fourth year	The curriculum was integrated into all four-years of undergraduate medical education (UME). Please refer to the detailed curriculum outlined by Symons et al. (2009) also included in this scoping review.
Tracy et al. (1996) ²⁰	Students (n = 25)	Australia	Quantitative	First year	The curriculum consisted of weekly sessions for two hours for twelve-weeks. Guest speakers were invited to give the students the opportunity to hear about the experiences with their disability in more detail. The students were evaluated on their attendance and participation, and each was involved in a role play during the last session.
Watmough et al. (2014) ⁷	Students (n = 20)	UK	Qualitative	Third year	A Problem Based Learning (PBL) course at the University of Liverpool on disability was developed. The aim of the disability rotation was to improve communication skills, introduce the concept of disability and social models of disability. The rotation consists of six full-day small group tutorial sessions which include two small-group communication skill sessions and PBL scenarios that encourage the students to explore issues associated with disability and five-days at a GP placement where they were involved in the care of two patients.
Wells et al. (2002) ¹⁸	None	UK	Letter to the Editor	First to fourth year	Disability based curricula was taught at Bristol Medical School to help medical students overcome their misinterpretations and biases regarding disabilities.
Woodard et al. (2012) ³	Students (n = 245)	USA	Quantitative	Third year	A new training module related to disability was developed at the University of South Florida (USF). Students had to participate in a twelve-week clerkship on primary care and special individuals. The students had to attend two separate half days both focused on general disability education. Half of the duration of the clerkship (six weeks) was spent with a disability module and the remaining six weeks focusing on clerkship.

Table 2. Key study findings

Authors (Year)	Aims	Key Findings Related to disability curriculum
Ankam et al. (2019) ²²	The aim was to implement a disability curriculum and explore how it improved students' understanding and clinical knowledge while providing care to patients with disabilities.	Undergraduate medical students were taught to care for individuals with disabilities using the Miller's pyramid scheme, which is described as a method of hierarchy for comprehension, performance, and action. This curriculum employed learning through play methods which increased skills and clinical knowledge of medical students.
Borowsky et al. (2021) ⁵	The goal of the curriculum was to equip medical students with a structural and human rights framework for understanding their patients' disability.	Following the implementation of this curriculum, students reported improved understanding of their patients' disability ($p = 0.3$) with acknowledgement of predisposed bias ($p < .001$) and increased confidence in their interactions with their patients ($p < .001$).
Castro et al. (2018) ¹⁰	The purpose was to provide an overview of educational intervention that aimed to improve the understanding and competencies required by students in the holistic management of people with disabilities.	Students reported increased communication efficacy, fostered their ability to accurately diagnose and provide care for patients, improved ethical attitudes and increased competency in their clinical skills. Major themes reported in this study included leadership, management, and continuing education with an extensive improvement on students' clinical skills.
Crotty et al. (2000) ¹¹	The goal of the curriculum was to provide students with tools necessary for providing care for individuals with disabilities.	Ninety six percent of students reported the experience as a valuable part of their curriculum. Students were taught about the rehabilitation process and the role of a therapist through self-learning that allow students to acquire knowledge, skills and attitudinal changes required for best care for patients with disabilities.
Galil et al. (1996) ¹²	The goal of the study was to bring about positive changes in how medical students viewed people with disabilities.	Findings revealed that these programs were helpful in reforming student's previous negative attitudes and bias, allowing the students to create a sense of compassion while caring for people with disabilities.
Graham et al. (2009) ²¹	The purpose was to determine whether a unique didactic teaching method that focused on delivering health care to patients with disabilities impacted medical students' knowledge of specific disabilities and their comfort with this population.	Students demonstrated reduced feelings of discomfort ($p \leq 0.002$) and improved comfortability in their communication and interactions with patients with disabilities while also being able to develop a sense of empathy ($p = 0.003$).
Jones et al. (2007) ²³	To describe and implement a community pediatrics placement within a school setting that taught undergraduate medical students about disability.	Students reported the community placement was a positive experience, with students having an improved understanding of children with disabilities. Medical students demonstrated developing vital clinical pediatric skills for providing care to these children.
Loerger et al. (2019) ⁶	The aim of this review was to examine existing body of literature and to determine effects of educational interventions on medical students about disability.	Fifty-three studies were included in this systematic review that reported attitudinal changes, improved skills, and knowledge among medical trainees. However, majority of the studies focused on general feedback rather than specific details on long term post curriculum interventions.
Long-Bellil et al. (2011) ⁹	The goal was to improve communication skills, comfortability, and change in attitudes towards people with disabilities.	The programs at each of the medical schools implemented the use of standardized patients to educate medical students about disabilities. The results showed that students reported higher levels of comfort, increased knowledge, positive change in attitudes among students, and increased compassion for patients with disabilities.
Marshall et al. (1991) ¹⁷	The goal of the study is to create a standardized countrywide curriculum to provide patient-led teaching to medical students.	The results showed that students' altruistic attitudes and their ability to build relationships with their patients improved to a greater extent. The study results indicated that there was improvement in their interactions as well as the general sense of understanding for these patients.
¹⁹ Medina-Walpole et al. (2012)	The purpose was to investigate whether students' predetermined attitudes and misconceptions could be shaped by early curricular intervention.	Students felt increased comfortability ($p \leq 0.0001$) and pleasure ($p = 0.03$) with patient interactions, and reduced levels of prejudice and negative attitudes.
Rogers et al. (2016) ¹⁶	The new curriculum focused on complexity of disability, health care disparities, and bias.	Students described the curriculum as being valuable as it led to increased local disability community involvement and allowed medical students reflect and reconsider their biases while providing care to people with disabilities.
Sarmiento et al. (2016) ¹³	Curriculum focused on educating medical students about how to gain better understanding	Students described the curriculum as a positive experience as it increased their understanding of the hardships individuals with disabilities had to face and the impact of disability on their patients' day to day life.

	of the hardships faced by their patients with disabilities and their everyday experiences.	
Sheppard et al. (2017) ¹⁵	The aim was to assess the efficacy of an educational intervention designed to introduce the topics of special education law and practices as well as working with children with disabilities.	Medical students reported greater necessity in the value of support systems for patients and their family. Students' understanding for special law education and its application increased significantly. Qualitative thematic analysis resulted in two major themes related to reliance on information and knowledge for physicians' ability to diagnose, as well as how this knowledge impacted the patient-physician relationship.
Symons et al. (2009) ²	The objective of this paper was to describe the development and initial implementation of a curriculum for teaching medical students to care for patients with disabilities.	Findings from this study allowed medical students to foster an understanding of the hardships these individuals faced. Students also reported increase in their knowledge, and skills necessary for treating their future patients.
Symons et al. (2014) ¹⁴	To test differences in mean scores between intervention and control groups on individual post-survey items regarding attitudes toward people with disabilities, and to examine individual factors that accounted for group differences.	Results from this study revealed that there were significant changes in students' attitude, comfort in interacting with individuals with disability and positive impression of self-concept of people with disability. The intervention group indicated that men were more likely to have negative reactions ($p=0.005$) compared to their female counterparts which led the authors to conclude that this was a gendered phenomenon.
Tracy et al. (1996) ²⁰	The aim was to demonstrate the impact of a disability course on first year medical students' perception and attitudes towards individuals with disabilities.	Majority of students felt that they had an initial sense of discomfort and reduced confidence when interacting with patients with disabilities, which later progressed to the development of understanding for these patients as well as improved attitudes and altered beliefs. Furthermore, students developed a sense of apprehension for the hardships these patients faced.
Watmough et al. (2014) ⁷	This study examines the impact of a seven-week community-based placement on for third-year medical students and their understanding of disability.	Students regarded their participation in this community placement as a positive experience which allowed them to gain more clinical knowledge from visiting care homes in comparison to the classroom teaching.
Wells et al. (2002) ¹⁸	The goal of the curriculum was to reform attitudes and misconceptions that medical students had about individuals with disabilities.	Results showed that medical students gained greater knowledge related to the social characteristics of disabilities and improved their patient-physician relationship.
Woodard et al. (2012) ³	The purpose of the new training module was to increase formal training in medical school and improve clinical proficiency as well as endorse positive attitudes towards individuals with disabilities.	Results demonstrated that students had improved knowledge ($p<.001$), attitudes ($p<.001$), and comfort ($p<.001$) while providing care to people with disabilities.