

# Knowledge Retention and Clinical Skills Acquisition in Sexual and Gender Minority Health Curricula: A Systematic Review

Janke B. Mains-Mason, MPH, Eloho Ufomata, MD, MS, J. Klint Peebles, MD, Cherie P. Dhar, MD, Gina Sequeira, MD, Rebekah Miller, MLIS, Barbara Folb, MM, MLS, MPH, and Kristen L. Eckstrand, MD, PhD

## Abstract

### Purpose

To identify exemplary medical education curricula, operationalized as curricula evaluating knowledge retention and/or clinical skills acquisition, for health care for sexual and gender minoritized (SGM) individuals and individuals born with a difference in sex development (DSD).

### Method

The authors conducted a systematic review of the literature using Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Searches were performed in PubMed/MEDLINE, The Cochrane Library, Web of Science, ERIC, Embase, PsycINFO, and the gray literature to identify studies that (1) pertained to undergraduate and/or graduate medical education, (2)

addressed education on health care of SGM/DSD individuals, and (3) assessed knowledge retention and/or clinical skills acquisition in medical trainees. The final searches were run in March 2019 and rerun before final analyses in June and October 2020.

### Results

Of 670 full-text articles reviewed, 7 met the inclusion criteria. Five of the 7 studies assessed trainee knowledge retention alone, 1 evaluated clinical skills acquisition alone, and 1 evaluated both outcomes. Studies covered education relevant to transgender health, endocrinology for patients born with DSDs, and HIV primary care. Only 1 study fully mapped to the Association of American Medical Colleges (AAMC) SGM/DSD

competency recommendations. Six studies reported institutional funding and development support. No studies described teaching SGM/DSD health care for individuals with multiply minoritized identities or engaging the broader SGM/DSD community in medical education curriculum development and implementation.

### Conclusions

Curriculum development in SGM/DSD health care should target knowledge retention and clinical skills acquisition in line with AAMC competency recommendations. Knowledge and skill sets for responsible and equitable care are those that account for structures of power and oppression and cocreate curricula with people who are SGM and/or born with DSDs.

**S**exual and gender minoritized (SGM) individuals and individuals born with a difference in sex development (DSD) experience ongoing health inequities that are, in part, caused by intersecting systems of oppression embedded in health care and medical education.<sup>1-6</sup> Despite decades of social changes and developments to include medical education content on people who are SGM and/or born with DSDs,<sup>7</sup> in 2011, a landmark national survey found that medical schools across the United States had few to no content hours on SGM/

DSD medical education.<sup>8</sup> At the time, common barriers to implementing medical education curricula on SGM/DSD health care included uncertainty of what content to teach and where to include it in the existing curriculum, absence of trained faculty to teach, and lack of resources to teach the content well.<sup>8,9</sup> In response, in 2014, the Association of American Medical Colleges (AAMC) released *Implementing Curricular and Institutional Climate Changes to Improve Health Care for Individuals Who Are LGBT, Gender Nonconforming, or Born With DSD: A Resource for Medical Educators* (herein referred to as the AAMC SGM/DSD competencies) and defined physician competence for caring for patients who are SGM and/or born with DSDs.<sup>10,11</sup> These guidelines set the expected outcome of physician education such that the spectrum of SGM/DSD training curricula before independent practice, including undergraduate medical education (UME) and graduate medical

education (GME), plays a role in supporting the acquisition of physician competence.<sup>10</sup>

Physician competence and entrustability frameworks are central to medical education curricula.<sup>12,13</sup> These frameworks focus on a combination of attitudes, behaviors, knowledge, and skills necessary to perform the job of a physician.<sup>12,13</sup> Many published studies of SGM curricula describe student attitudes, implicit biases, and confidence in caring for people who are SGM, showing favorable attitudes, implicit biases, and low confidence in care.<sup>14</sup> However, few published studies investigate DSD curricula,<sup>15</sup> and even fewer focus on the components of competence and entrustability frameworks, including knowledge retention and clinical skills acquisition.<sup>16</sup>

*Knowledge retention* refers to the ability to store and use factual information after initial didactic presentation.<sup>17</sup> *Clinical*

Please see the end of this article for information about the authors.

Correspondence should be addressed to Kristen L. Eckstrand, 121 Meyran Ave., #301, Pittsburgh, PA 15213; email: eckstrandkl@upmc.edu.

*Acad Med.* 2022;97:1847-1853.  
First published online June 14, 2022  
doi: 10.1097/ACM.00000000000004768

Copyright © 2022 by the Association of American Medical Colleges

Supplemental digital content for this article is available at <http://links.lww.com/ACADMED/B288>.

*skills acquisition* refers to a learned and observable behavior within the process of patient care.<sup>18</sup> A recent systematic review found that most published curricula evaluate pre/post, self-reported, or qualitative components of knowledge but objectively assess neither knowledge retention nor clinical skills acquisition relevant to caring for individuals who are SGM and/or born with DSDs.<sup>19</sup> Knowledge retention and clinical skills are necessary to ensure quality in patient care, and both are challenging to assess,<sup>20,21</sup> especially given the apparent dearth of examples in the literature on SGM/DSD health care education.

Institutional support, intersectionality, and community engagement are critical components of structural competency when caring for individuals who are SGM and/or born with DSDs.<sup>22</sup> Structural competency, a pedagogical framework for addressing health-related social justice concerns, is essential to quality care for people who are SGM and/or born with DSDs.<sup>23</sup> Cissexism and heterosexism are oppressions based on assumption of cisgender and heterosexual identities and binary sexes (with associated assumptions about sexed bodies).<sup>24</sup> Intersectionality theory emphasizes cisheterosexist impacts on health care for multiply minoritized individuals across intersecting structures of racism, settler colonialism, classism, ableism, and (trans)misogyny.<sup>25–27</sup> Institutional support has the potential to rectify traditional power imbalances in medical education by providing time, funding, and priority.<sup>28</sup> Community-engaged approaches have the same potential to rectify power imbalance by including members of communities affected by curriculum in their development.<sup>29</sup>

The purpose of this systematic review is to identify exemplary SGM/DSD medical education curricula, operationalized as curricula evaluating knowledge retention and/or clinical skills acquisition. This systematic review additionally seeks to understand whether medical education curricula apply and are aligned with national curricular recommendations set forth by the AAMC SGM/DSD competencies.<sup>10</sup> Lastly, we examine the extent to which medical education curricula are institutionally supported, intersectional, and created alongside people in health care who are SGM or are born with DSDs.

## Method

### Search strategy

The search was developed in PubMed/MEDLINE by 2 University of Pittsburgh librarians (R.M. and B.F.). Concepts searched included (1) medical education at undergraduate, graduate, or fellowship levels; (2) curriculum; and (3) sexual minorities, gender minorities, and DSDs. Search terms to represent each concept were obtained from existing systematic reviews,<sup>30</sup> Medical Subject Heading controlled vocabulary, and text mining of preliminary search results using PubReMiner and the TERMINE batch service.<sup>31,32</sup> Harvested vocabulary was tested in PubMed/MEDLINE by the 2 librarians (R.M. and B.F.).

The complete search run in PubMed/MEDLINE is shown in Supplemental Digital Appendix 1, available at <http://links.lww.com/ACADMED/B288>. The PubMed/MEDLINE search was adapted to search the following databases: the Cochrane Library, Web of Science Core Collection, ERIC (via EBSCOhost), Embase, MedEdPORTAL, and APA PsycINFO (via Ovid). Gray literature sources included Google, dissertations, and conference papers identified in the database searches. We conducted cited reference searching for key references and the studies included in the final systematic review to supplement the database searches. The final searches were run in March 2019 and rerun before final analyses in June and October 2020.

This review used Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines in the presentation of research data.<sup>33</sup> The review was not registered, but a protocol was developed and may be accessed in Supplemental Digital Appendix 2 available at <http://links.lww.com/ACADMED/B288>.

### Inclusion and exclusion criteria

This review was not limited to a specific time frame. We included studies for review that (1) pertained to UME and/or GME, (2) addressed education on health care of people who are SGM and/or born with DSDs, and (3) assessed at least 1 of 2 educational outcomes: knowledge retention and/or clinical skills acquisition in trainees. We defined *knowledge retention* as any content taught in an SGM/DSD curriculum that is recalled after the discrete

curriculum is taught, operationalized as curricular content recalled after 1 or more days of receiving curricula.<sup>17</sup> We defined *clinical skills acquisition* as a “discrete and observable act of clinical care.”<sup>18</sup> In addition, studies had to be published in the English language. Studies that did not meet inclusion criteria were excluded from this review. We also excluded conference abstracts that were not detailed enough to assess our inclusion criteria, did not have an associated published full text, or had authors who could not be contacted for clarification regarding their published data.

### Title and abstract review

Deduplicated<sup>34</sup> search results were imported into DistillerSR (Evidence Partners, Ottawa, Ontario, Canada) for inclusion analysis and data extraction. Studies were screened for eligibility by 5 independent reviewers (J.B.M.-M., E.U., J.K.P., C.P.D., and G.S.). We selected articles for full-text review if they pertained to UME and/or GME and addressed education on health care of individuals who are SGM and/or born with DSDs. Articles could be included for full-text review even if they did not discuss knowledge retention or clinical skills acquisition in the abstract. Studies were included or excluded based on consensus between 2 reviewing authors. A discrepancy in classification was settled by a separate third reviewer (K.L.E.).

### Full-text review and data extraction

Full-text articles were reviewed in their entirety for inclusion by 6 independent reviewers (J.B.M.-M., E.U., J.K.P., C.P.D., G.S., and K.L.E.). We selected full texts for data extraction if they fulfilled our 3 inclusion criteria of UME and/or GME, education on health care of individuals who are SGM and/or born with DSDs, and 1 of the 2 education outcomes of knowledge retention and/or clinical skills acquisition. Two reviewers were needed to include the article for data extraction; discrepancies were settled by a third independent reviewer (J.B.M.-M., E.U., and/or K.L.E.). Full texts that did not fulfill these criteria were excluded. To better understand outcomes assessed by excluded articles, reviewers noted whether the article assessed outcomes not specific to this review (e.g., attitudes, beliefs, confidence) or if the article did not assess an intervention. For data extraction, 3 reviewers (J.B.M.-M., E.U., and K.L.E.) determined whether included studies assessed knowledge retention, clinical skills acquisition, or both. We

assessed whether the studies referenced the AAMC SGM/DSD competencies and/or mapped their outcomes to these competencies.<sup>10</sup> We identified whether the educational intervention was delivered at the UME or GME level. If the study was at the UME level, we identified whether the intervention was delivered during preclinical or clinical years; if the study was at the GME level, we identified whether the intervention was delivered during residency or fellowship and which specialties were targeted. We determined whether these interventions were delivered cross-sectionally or longitudinally. We added assessments of the presence of funding, development time, and trained faculty in author-affiliated projects and institutions after the initial protocol was developed. Lastly, we investigated whether included articles discussed multiple dimensions of SGM/DSD identity or engaged the SGM/DSD community in program development. We sought to obtain all results compatible with each outcome domain. When data were missing or unclear information was

present, we assumed the information was unknown and collaborated on possible explanations for missing data.

Risk of bias was assessed by team consensus with this study's lead authors (J.B.M.-M., E.U., and K.L.E.) using the Critical Appraisal Skills Programme Checklist.<sup>35</sup> Risk of bias was assessed in October 2021.

## Results

### Screening and inclusion details

A total of 3,474 articles were identified for review based on the search results (Figure 1). Of these, 2,797 (80.5%) were excluded because they did not pertain to SGM medical education. Of the remaining 677 articles, 491 (72.5%) were excluded because they did not assess knowledge retention (6 [0.9%]) or clinical skills acquisition (2 [0.3%]) in SGM/DSD health care education curricula. Another 179 (26.4%) of the 677 articles were excluded because they were conference

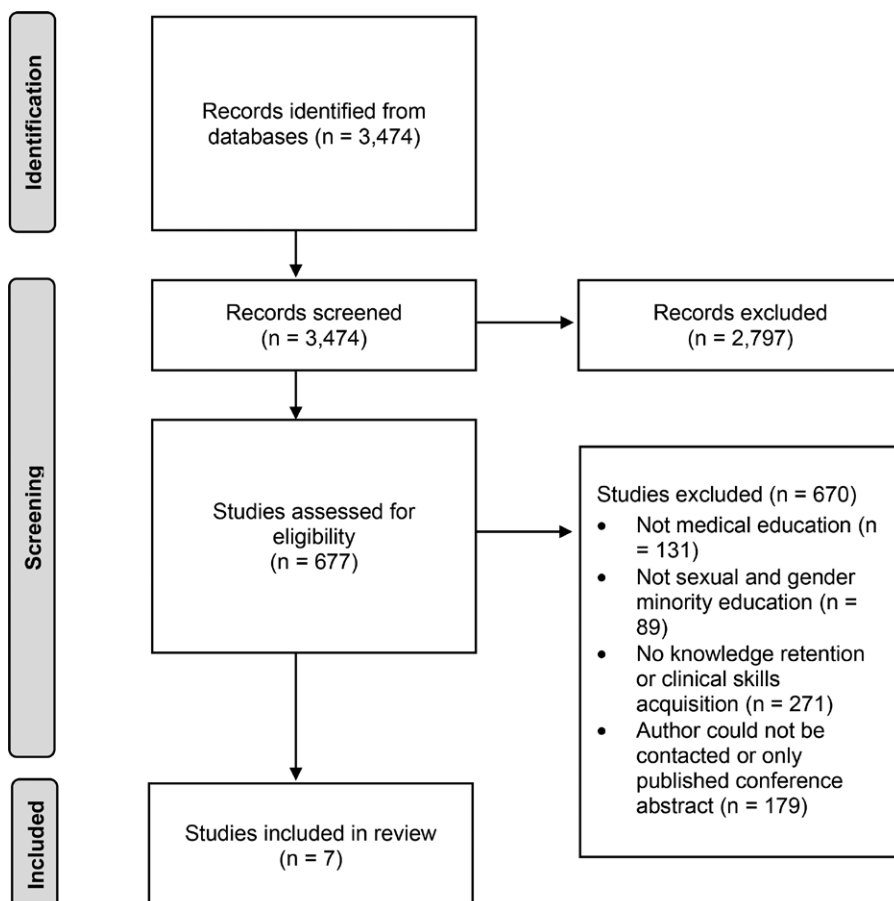
abstracts for which the authors could not be contacted (unavailable contact information or no response) for clarification on methods or no associated full-length manuscript was available. Excluded SGM/DSD studies instead generally presented observational or theoretical findings (155 of 271 [57.2%]), findings of knowledge without retention (29 of 271 [10.7%]), and findings of attitudes and behaviors (31 of 271 [11.4%]). A total of 7 studies (1.0%) were included for final review (Table 1).<sup>36-42</sup>

### Knowledge retention and skill acquisition

Five of the 7 studies assessed trainee knowledge retention alone.<sup>36-40</sup> One study was related to LGBT (lesbian, gay, bisexual, and transgender) adolescent health,<sup>36</sup> and 4 studies were related to transgender health,<sup>37-40</sup> 2 of which focused specifically on transgender youth.<sup>37,38</sup> Three studies were delivered cross-sectionally<sup>36,38,39</sup> and 2 longitudinally<sup>37,40</sup> (Table 1). The educational interventions were delivered using a 10-session elective course<sup>40</sup>; 1 or 2 lectures<sup>37</sup>; 6 online modules<sup>38</sup>; and 1-time, 1-hour lectures.<sup>36,39</sup> All studies demonstrated improvements in knowledge retention, including knowledge retention on pubertal suppression and hormonal transition in transgender youth<sup>37</sup>; physical examination approaches and psychosocial and medical considerations for primary care of transgender youth<sup>38</sup>; increasing insurance coverage for transgender patients<sup>39</sup>; and terminology, medical care, and policies informing transgender health care.<sup>40</sup>

One of the 7 studies assessed trainee clinical skills acquisition alone.<sup>41</sup> The study, implemented among pediatric endocrinology fellows, used 2 interactive online cases and follow-up open questions focused on communication skills between physicians and patients born with DSDs. Few endocrinology fellows in this study demonstrated the ability to adequately provide reassurance to family members of children with DSDs, inform family members of the clinical course of the DSD, discuss long-term implications, and define the role of the DSD team in multidisciplinary patient care.

One of the 7 studies assessed both clinical skills acquisition and knowledge retention



**Figure 1** Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)<sup>33</sup> flowchart of record exclusion, inclusion, and review process of 7 studies assessing medical student, resident, or fellow knowledge retention and clinical skills acquisition for health care for sexual and gender minoritized individuals and individuals born with a difference in sex development.

**Table 1**  
**Characteristics of 7 Studies Included in a 2020 Systematic Review of Curricula Assessing Medical Trainee Knowledge Retention and Clinical Skills Acquisition for SGM/DSD Health Care**

Author, year	Study design (duration)	No. of participants/trainee level	Knowledge retention	Skill acquisition	Use of AAMC SGM/DSD competencies <sup>b</sup>	Study description	Systematic review primary outcomes
Braun et al, 2017 <sup>40</sup>	Longitudinal (3 months)	147/UIME	Y	N	N	Preclinical medical students completed an elective 10-hour course on transgender health with knowledge retention assessed before, immediately after, and 3 months after completion of the elective.	At 3 months, students demonstrated improvements in and retention of knowledge in 8 of 11 content areas: terminology, health disparities, best practices for medical care, best practices for data collection in EHRs, and state and federal policies.
Fessler et al, 2017 <sup>42</sup>	Longitudinal (3 years)	12/GME	Y	Y	N	Graduate medical trainees completed a 3-year primary care residency aimed at achieving certification in HIV care with additional content targeting LGBT primary care. OSCEs were completed at the end of the training year.	In demonstration of knowledge retention and clinical skills, HRSA HIV/AIDS Bureau Performance Measure Portfolio showed that residents achieved appropriate clinical outcomes.
Kranenburg et al, 2017 <sup>41</sup>	Cross-sectional	94/GME	N	Y	N	Pediatric endocrinology fellows participated in a training program assessing clinical communication skills between physicians and parents of children born with DSDs.	After participation, few fellows were able to provide reassurance to parents of children with DSDs, inform parents of the clinical course and long-term implications for the presented DSDs, or educate parents about the role of clinical DSD team in caring for their child.
Najor et al, 2020 <sup>39</sup>	Longitudinal (1 year)	44/UIME	Y	N	N	First-year medical students participated in a mandatory 1-hour lecture on health care for transgender and gender diverse individuals.	One year after the lecture, students demonstrated improvements in and knowledge retention of 1 of 6 domains: correct identification that insurance companies are increasing coverage for transgender services.
Turban et al, 2018 <sup>37</sup>	Cross-sectional	162/UIME	Y	N	N	First- through fourth-year medical students received a 1-hour lecture on care of transgender youth during their first year and another 1-hour lecture during their third-year pediatrics clerkship. Knowledge retention was assessed for all students across years at a single timepoint such that some students had received 1 lecture and others received 2.	Medical students demonstrated knowledge retention in 2 of 10 knowledge items: time requirement to meet criteria for DSM-5 requirement for gender dysphoria and awareness of spironolactone as a medical intervention for transgender individuals.
Vance Jr et al, 2018 <sup>38</sup>	Cross-sectional	319/UIME or GME	Y	N	N	Fourth-year medical students and first-year residents in pediatrics and psychiatry completed 6 online modules on pediatric transgender health with knowledge assessed 1 week after module completion.	After completion of modules, medical students and trainees demonstrated increased objective knowledge (measured as percentage correct on an unpublished 9-scale questionnaire) on topics relating to health care of transgender youth.
Wahlen et al, 2020 <sup>36</sup>	Cross-sectional (1 month)	117/UIME	Y	N	N	Fourth-year medical students completed a 1-hour didactic lecture focused on LGBT health. Knowledge was measured before and 1 week after the lecture.	After completion of the lecture, students demonstrated clinical knowledge retention in LGBT, as measured by a composite knowledge measure from 9 knowledge items across LGBT health.

Abbreviations: AAMC, Association of American Medical Colleges; DSD, difference in sex development; DSM-5, *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition*; EHR, electronic health record; GME, graduate medical education; HRSA, Health Resources and Services Administration; LGBT, lesbian, gay, bisexual, and transgender; OSCE, observed structured clinical examination; SGM, sexual and gender minoritized; UIME, undergraduate medical education.

<sup>a</sup>Sample includes all participants who completed all study components (including follow-up).

<sup>b</sup>AAMC Advisory Committee on Sexual Orientation, Gender Identity, and Sex Development; Andrew D. Hollenbach, Kristen L. Eckstrand, Alice Dreger, eds.<sup>10</sup>

<sup>c</sup>Sample includes trainees across several health care professions.



as part of a 3-year HIV primary care track for residents with a secondary focus on SGM health.<sup>42</sup> Trainees developed knowledge throughout the 3-year track, and 7 of 8 graduates from the first cohort received certification from the American Academy of HIV Medicine. Clinical outcomes related to HIV were measured, with residents who participated in the track meeting the expected outcomes, although clinical skills and knowledge retention were not formally assessed.

### AAMC SGM/DSD competencies

All included studies were published after the 2014 AAMC SGM/DSD competencies became available, but only 1 study mapped its curriculum fully using the AAMC SGM/DSD competencies.<sup>42</sup> Of interest, Najor et al<sup>39</sup> referenced earlier learning objective recommendations from the AAMC without mapping the curriculum to them. One study cited the AAMC SGM/DSD competencies as demonstrating the need for the research but did not align its results with the AAMC competencies.<sup>40</sup> Two studies were conducted in Europe and understandably did not map their work to the AAMC competencies developed in North America.<sup>36,41</sup>

### Learners reached

Four of 7 curricula were offered as elective experiences,<sup>38,40–42</sup> whereas the other 3 were 1-time mandatory lectures.<sup>36,37,39</sup> Four studies assessed outcomes among medical education<sup>36,37,39,40</sup>: 1 assessed students in the preclinical years alone,<sup>39</sup> 1 assessed outcomes among students in their clinical years alone,<sup>36</sup> and 2 assessed outcomes among students in both their clinical and preclinical years.<sup>37,40</sup> Two studies assessed outcomes in graduate medical education: 1 among residents in internal medicine<sup>42</sup> and 1 among fellows in pediatric endocrinology.<sup>41</sup> One study assessed outcomes across UME and GME, including fourth-year medical students, pediatric interns, and psychiatry interns.<sup>38</sup>

### Institutional funding and development support

Four of the included studies reported external funding for their curricular projects,<sup>38,40–42</sup> whereas 3 reported no funding.<sup>36,37,39</sup> One specifically highlighted that longitudinal assessment was impaired because of a lack of funding,<sup>40</sup> and 1 noted concerns for financial sustainability.<sup>42</sup> All studies that reported study onset relative to publication<sup>38–40,42</sup>

required a minimum of 3 years to complete. Studies were hosted at worldwide institutions,<sup>36,41</sup> including the Yale School of Medicine,<sup>37</sup> the University of California San Francisco,<sup>38,40,41</sup> the Mayo Clinic Alix School of Medicine,<sup>39</sup> and The Fenway Institute.<sup>42</sup> The Fenway Institute, the University of California San Francisco, and the Yale School of Medicine are nationally recognized for their strong commitments to education and training on LGBTQ+ (lesbian, gay, bisexual, transgender, and queer) issues, including dedicated clinical infrastructures to caring for patients who are SGM and longitudinal curricula on SGM health.<sup>43</sup> These medical schools and joint health centers additionally have nationally recognized teaching faculty with expertise in SGM/DSD health care.

### Intersectionality and community engagement

None of the included studies described efforts to include learning modules about people who are SGM or born with DSDs with multiple minoritized identities. One study involved medical residents in providing care to people living with HIV such that the general SGM population would shape the knowledge development of trainees.<sup>42</sup> No other studies described involving the broader SGM community in creating the curricula for medical trainees. However, all except 1 study<sup>37</sup> reported methods showing that they included expert physicians (many of whom identify as SGM) and had previously published literature and guidelines to shape what was taught.

### Risk of bias

Supplemental Digital Appendix 3, available at <http://links.lww.com/ACADMED/B288>, summarizes the results of our risk of bias assessment. All but 1 study had minimal risk of bias.<sup>37</sup>

### Discussion

Since the 2014 release of the AAMC SGM/DSD competencies,<sup>10</sup> development of medical education curricula related to the health of people who are SGM or born with DSDs has increased. We screened 677 full-text articles that focused on a range of outcomes within SGM/DSD health care education (Figure 1). Few published studies assessed knowledge retention (6 [0.9%]) and clinical skills acquisition (2 [0.3%]).

Of the 7 included studies, 1 study<sup>42</sup> specifically used the AAMC SGM/DSD competencies in guiding their curricular content, whereas the other 6 studies did not.<sup>36–41</sup> These 7 studies<sup>36–42</sup> took place within relatively supportive institutional environments. None of these studies described specifically teaching intersectionality in SGM/DSD health care. None of these studies described engaging broader community members without clinical training who are SGM or born with DSDs when shaping the delivered medical education curriculum.

Three major themes arose in our review. First, the current published literature delivers curricular interventions that evaluate attitude and behavior outcomes but typically do so without balanced representation of knowledge retention and clinical skills evaluation. Studies of behavior outcomes assessed elective or 1-time mandatory lectures, not core curricula.<sup>41,42</sup> All included studies were published after the 2014 AAMC SGM/DSD competencies,<sup>36–42</sup> but only 1 study<sup>42</sup> mapped its curriculum fully using the AAMC SGM/DSD competencies. Core curricula that are aligned with national competencies and target all 4 outcomes are necessary for development and implementation of more rigorous and standardized SGM/DSD health care training. The second theme was of limited curricular attention to people born with DSDs. Only 1 study assessed clinical skills in DSD health care.<sup>41</sup> DSDs are commonly taught in UME in embryology courses, may be tested across medical training and licensing (i.e., knowledge retention), and warrant curricular attention. Existing DSD medical education competencies may provide a starting point for expanding DSD curricula.<sup>10</sup> Spanning these challenges is the third and last theme: institutional support and structures of oppression. Core curricula that align with national competencies and accurately assess student attitudes, behaviors, knowledge, and clinical skills in regard to SGM/DSD health care require funding and time.<sup>38–40,42</sup> These curricula require intersectionality to convey and counteract the impacts of cisheterosexism across intersecting structures of racism, settler colonialism, classism, ableism, and (trans)misogyny among indigenous, class-oppressed,

disabled, and transfeminine queer people of color.<sup>25,26</sup> The small number of curricula that met the criteria for inclusion in this systematic review suggests that although the AAMC has recommended content to teach, known barriers—such as trained faculty, resources, and development time—may continue to impede development of high-quality curricula.<sup>8,9</sup> Other factors may have contributed to the small number of curricula, and future research should explore how institutions hinder or support the development, assessment, and publication of content related to knowledge retention and clinical skills in SGM/DSD health care.

To identify transformative solutions, we may find guidance from individuals who are part of SGM/DSD communities working to implement SGM/DSD curricula.<sup>44</sup> Community engagement approaches are demonstrably feasible.<sup>44–46</sup> Community engagement is a critical component of structural competency that aims to recenter and balance knowledge (and the power associated with knowledge) within communities affected by such knowledge.<sup>5,47</sup> We emphasize the specific importance that our innovative strategies can and must be taught consistently with express attention to intersecting systems of oppression, equity, and justice. Community engagement and intersectionality are critical components of structural competency, such that building engagement among multiply minoritized people and/or people born with DSDs and teaching to their needs supports achievement of competence across structures of oppression.<sup>23</sup>

### Limitations

This systematic review has several important limitations. First, although we focus on physician education at the undergraduate and graduate levels, given the emphasis on AAMC SGM/DSD competencies,<sup>10</sup> health care systems are composed of diverse health professions that all contribute to the experience of health care. As curricula increase across these diverse health professions, we encourage ongoing systematic reviews for continuing critical reflection and lesson-learning across health care professions. Second, all studies that met our inclusion criteria and were included for final analysis were limited to scholarly,

peer-reviewed work published in the English language. In addition, a notable finding of our review was that most of the included studies were conducted at institutions with strong SGM/DSD health care education programs, which may suggest that confounding factors—such as institutional support—exist, leading to their inclusion. Additional curricula have likely not yet been published in conference abstracts or journals, are being used in local environments that are less affirming of SGM/DSD content, and/or have been published in a language other than English, and these curricula should be explored. Future efforts should be made to help educators translate effective curricula into nationally accessible spaces. We also acknowledge that included curricula may have been community informed or included aspects of intersectionality, yet such curricula have not been published, which may reflect other challenges in the publication and review process. Recent calls have been made for how reviewers and journals can support intersectional work that can further help to build an evidence base for curricula that address inequity.<sup>48</sup>

### Conclusions

Our systematic review demonstrates that although there are an increasing number of published curricula that address SGM/DSD health care, few of these curricula examine the higher-level outcomes of knowledge retention and clinical skills acquisition. In addition to supporting the development of effective and impactful curricula that support the health needs of people who are SGM or born with DSDs, this review renews focus on the charge to create high-level curricula developed alongside SGM/DSD communities, which address intersectional influences in health. We call on institutions of medical education to be active participants in combatting cisheterosexism across dimensions of race, indigeneity, class oppression, disability, and (trans)femininity. This action is imperative to building knowledge and skill sets for responsible and equitable care for people who are SGM or born with DSDs.

*Acknowledgments:* The authors would like to acknowledge the Iroquois tribes, Delaware, Shawnee, Wyandot, Mohican, and Tisagechroami (Pittsburgh); the Ojibwe, Odawa, Potawatomi, Miami, Ho-Chunk, Menominee, Sac, Fox, Kickapoo, and

Illinois (Chicago); Piscataway, Pamunkey, Rappahannock, Nentego, Mattaponi, Chickahominy, Monacan, and Powhatan (Washington, DC); and the Duwamish (Seattle) nations and peoples, whose stolen land houses our institutions. We further acknowledge the queer, intersex, and transgender people, especially queer, intersex, and transgender people of color, whose medical care is disproportionately affected by the curricula we do and do not teach. These acknowledgments are accompanied by donations to Shawnee Tribe Cultural Center, SisTers PGH, Grow Pittsburgh, True T PGH, Chicago House, National Museum of the American Indian, Native Governance Center, and Native American Rights Fund by the authors. The authors hope readers will learn the history of their own places, get involved, and donate to their own local queer- and indigenous-led organizations. The authors thank these organizations and the communities they represent for their historic and continued work to build liberation for us all. For more on land acknowledgments, see “A Guide to Indigenous Land Acknowledgement” at NativeGov.org.

*Funding/Support:* None reported.

*Other disclosures:* None reported.

*Ethical approval:* Reported as not applicable.

**J.B. Mains-Mason** is a senior research associate, Department of Pathology, University of Pittsburgh Medical Center Magee-Womens Hospital, Pittsburgh, Pennsylvania.

**E. Ufomata** is assistant professor, Department of Internal Medicine, University of Pittsburgh School of Medicine, Pittsburgh, Pennsylvania; ORCID: <http://orcid.org/0000-0002-2175-806X>.

**J.K. Peebles** is a dermatologist, Kaiser Permanente Mid-Atlantic Permanente Medical Group, Washington, DC.

**C.P. Dhar** is assistant professor, Department of Pediatrics, Northwestern University Feinberg School of Medicine, Chicago, Illinois; ORCID: <http://orcid.org/0000-0003-1994-3722>.

**G. Sequeira** is assistant professor, Department of Pediatrics, Seattle Children's Hospital, Seattle, Washington; ORCID: <http://orcid.org/0000-0001-5906-869X>.

**R. Miller** is a research and instruction librarian, Health Sciences Library System, University of Pittsburgh, Pittsburgh, Pennsylvania; ORCID: <http://orcid.org/0000-0002-9783-8234>.

**B. Folb** is a public health informationist, Health Sciences Library System, University of Pittsburgh, Pittsburgh, Pennsylvania; ORCID: <http://orcid.org/0000-0001-5531-980X>.

**K.L. Eckstrand** is assistant professor, Department of Psychiatry, University of Pittsburgh School of Medicine, Pittsburgh, Pennsylvania; ORCID: <http://orcid.org/0000-0002-6506-3649>.

### References

1. Howard SD, Lee KL, Nathan AG, Wenger HC, Chin MH, Cook SC. Healthcare

- experiences of transgender people of color. *J Gen Intern Med.* 2019;34:2068–2074.
2. Kipke MD, Kubicek K, Akinyemi IC, et al. The healthy young men's cohort: Health, stress, and risk profile of Black and Latino young men who have sex with men (YMSM). *J Urban Health.* 2020;97:653–667.
  3. Woody I. Aging out: A qualitative exploration of ageism and heterosexism among aging African American lesbians and gay men. *J Homosex.* 2014;61:145–165.
  4. Latham J, Barrett C. Appropriate bodies and other damn lies: Intersex ageing and aged care. *Australas J Ageing.* 2015;34:19–20.
  5. Jones R, Crowshoe L, Reid P, et al. Educating for Indigenous health equity: An international consensus statement. *Acad Med.* 2019;94:512–519.
  6. Murphy M. Everywhere and nowhere simultaneously: The “absent presence” of sexuality in medical education. *Sexualities* 2019;22:203–223.
  7. Eckstrand KL, Sciolla AF. Chapter 2: The role of medical education and health care professionals in eliminating health disparities. In: Hollenbach AD, Dreger A, eds. *Implementing Curricular and Institutional Climate Changes to Improve Health Care for Individuals Who Are LGBT, Gender Nonconforming, or Born with DSD: A Resource for Medical Educators.* Washington, DC: Association of American Medical Colleges; 2014.
  8. Obedin-Maliver J, Goldsmith ES, Stewart L, et al. Lesbian, gay, bisexual, and transgender-related content in undergraduate medical education. *JAMA* 2011;306:971–977.
  9. Tamas RL, Miller KH, Martin LJ, Greenberg RB. Addressing patient sexual orientation in the undergraduate medical education curriculum. *Acad Psychiatry.* 2010;34:342–345.
  10. AAMC Advisory Committee on Sexual Orientation, Gender Identity, and Sex Development; Hollenbach AD, Eckstrand KL, Dreger A, eds. *Implementing Curricular and Institutional Climate Changes to Improve Health Care for Individuals Who Are LGBT, Gender Nonconforming, or Born With DSD: A Resource for Medical Educators.* Washington, DC: Association of American Medical Colleges; 2014.
  11. Englander R, Cameron T, Ballard AJ, Dodge J, Bull J, Aschenbrenner CA. Toward a common taxonomy of competency domains for the health professions and competencies for physicians. *Acad Med.* 2013;88:1088–1094.
  12. Frank JR, Snell LS, Cate OT, et al. Competency-based medical education: Theory to practice. *Med Teach.* 2010;32:638–645.
  13. Chen HC, van den Broek WES, ten Cate O. The case for use of entrustable professional activities in undergraduate medical education. *Acad Med.* 2015;90:431–436.
  14. Hayes V, Blondeau W, Bing-You RG. Assessment of medical student and resident/fellow knowledge, comfort, and training with sexual history taking in LGBTQ patients. *Fam Med.* 2015;47:383–387.
  15. Coutin A, Wright S, Li C, Fung R. Missed opportunities: Are residents prepared to care for transgender patients? A study of family medicine, psychiatry, endocrinology, and urology residents. *Can Med Educ J.* 2018;9:e41–e55.
  16. Bonvicini KA. LGBT healthcare disparities: What progress have we made? *Patient Educ Counsel.* 2017;100:2357–2361.
  17. Bell DS, Harless CE, Higa JK, et al. Knowledge retention after an online tutorial: A randomized educational experiment among resident physicians. *J Gen Intern Med.* 2008;23:1164–1171.
  18. AAMC Task Force on the Clinical Skills Education of Medical Students. *Recommendations for Clinical Skills Curricula for Undergraduate Medical Education.* Washington, DC: Association of American Medical Colleges; 2005.
  19. Sekoni AO, Gale NK, Manga-Atangana B, Bhadhuri A, Jolly K. The effects of educational curricula and training on LGBT-specific health issues for healthcare students and professionals: A mixed-method systematic review. *J Int AIDS Soc.* 2017;20:21624.
  20. Butler AC, Raley ND. The future of medical education: Assessing the impact of interventions on long-term retention and clinical care. *J Grad Med Educ.* 2015;7:483–485.
  21. Schuwirth LWT, van der Vleuten CPM. Challenges for educationalists. *BMJ.* 2006;333:544–546.
  22. Hansen H, Metz J, eds. *Structural Competency in Mental Health and Medicine: A Case-Based Approach to Treating the Social Determinants of Health.* Cham, Switzerland: Springer International Publishing; 2019.
  23. Donald CA, DasGupta S, Metz JM, Eckstrand KL. Queer frontiers in medicine: A structural competency approach. *Acad Med.* 2017;92:345–350.
  24. Preves SE. Sexing the intersexed: An analysis of sociocultural responses to intersexuality. *Signs.* 2002;27:523–556.
  25. Crenshaw K. Mapping the margins: Intersectionality, identity politics, and violence against women of color. *Stanford Law Rev.* 1991;43:1241.
  26. Eckstrand KL, Eliason J, St Cloud T, Potter J. The priority of intersectionality in academic medicine. *Acad Med.* 2016;91:904–907.
  27. Zeeman L, Sherriff N, Browne K, et al. A review of lesbian, gay, bisexual, trans and intersex (LGBTI) health and healthcare inequalities. *Eur J Public Health.* 2019;29:974–980.
  28. Streed CG, Lunn MR, Siegel J, Obedin-Maliver J. Meeting the patient care, education, and research missions: Academic medical centers must comprehensively address sexual and gender minority health. *Acad Med.* 2021;96:822–827.
  29. Strasser R, Worley P, Cristobal F, et al. Putting communities in the driver's seat: The realities of community-engaged medical education. *Acad Med.* 2015;90:1466–1470.
  30. Coulter RWS. *Detecting, Explaining, and Reducing Substance Use, Mental Health, and Violence Inequities for Sexual and Gender Minority Youth and Emerging Adults [dissertation].* Pittsburgh, PA: University of Pittsburgh; 2017.
  31. Koster J. *PubMed PubReminer.* <https://hgservers2.amc.nl/cgi-bin/miner/miner2.cgi>. Published 2014. Accessed June 5, 2022.
  32. Frantzi K, Ananiadou S, Mima H. Automatic recognition of multi-word terms. *Int J Digit Libr.* 2000;3:115–130.
  33. Page MJ, McKenzie JE, Bossuyt PM, et al. The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *Syst Rev.* 2021;10:89.
  34. Bramer WM, Giustini D, De Jonge GB, Holland L, Bekhuis T. De-duplication of database search results for systematic reviews in EndNote. *J Med Libr Assoc.* 2016;104:240–243.
  35. Critical Appraisal Skills Programme. *CASP cohort study checklist.* <https://casp-uk.net/casp-tools-checklists>. Accessed April 27, 2022.
  36. Wahlen R, Bize R, Wang J, Merglen A, Ambresin AE. Medical students' knowledge of and attitudes towards LGBT people and their health care needs: Impact of a lecture on LGBT health. *PLoS One.* 2020;15:e0234743e0234743.
  37. Turban JL, Winer J, Boulware S, VanDeusen T, Encandela J. Knowledge and attitudes toward transgender health. *Clin Teach.* 2018;15:203–207.
  38. Vance SR, Jr, Lasofsky B, Ozer E, Buckelew SM. Teaching paediatric transgender care. *Clin Teach.* 2018;15:214–220.
  39. Najor AJ, Kling JM, Imhof RL, Sussman JD, Nippoldt TB, Davidge-Pitts CJ. Transgender health care curriculum development: A dual-site medical school campus pilot. *Health Equity.* 2020;4:102–113.
  40. Braun HM, Garcia-Grossman IR, Quiñones-Rivera A, Deutsch MB. Outcome and impact evaluation of a transgender health course for health profession students. *LGBT Health.* 2017;4:55–61.
  41. Kranenburg LJC, Reerds STH, Cools M, et al. Global application of the assessment of communication skills of paediatric endocrinology fellows in the management of differences in sex development using the ESPE E-Learning.Org portal. *Horm Res Paediatr.* 2017;88:127–139.
  42. Fessler DA, Huang GC, Potter J, Baker JJ, Libman H. Development and implementation of a novel HIV primary care track for internal medicine residents. *J Gen Intern Med.* 2017;32:350–354.
  43. Soltke M, Sitkin NA, Schwartz ML, Encandela JA. Twelve tips for incorporating and teaching sexual and gender minority health in medical school curricula. *Med Teach.* 2019;41:141–146.
  44. Noonan EJ, Sawning S, Combs R, et al. Engaging the transgender community to improve medical education and prioritize healthcare initiatives. *Teach Learn Med.* 2018;30:119–132.
  45. Noonan EJ, Weingartner LA, Combs RM, et al. Perspectives of transgender and genderqueer standardized patients. *Teach Learn Med.* 2021;33:116–128.
  46. Greene RE, Blasdel G, Cook TE, Gillespie C. How do OSCE cases activate learners about transgender health? *Acad Med.* 2020;95(12 suppl):S156–S162.
  47. Krishnan A, Rabinowitz M, Ziminsky A, Scott SM, Chretien KC. Addressing race, culture, and structural inequality in medical education: A guide for revising teaching cases. *Acad Med.* 2019;94:550–555.
  48. Buchanan NT, Perez M, Prinstein M, Thurston I. Upending racism in psychological science: Strategies to change how our science is conducted, reported, reviewed, and disseminated. *Am Psychol.* 2021;76:1097–1112.