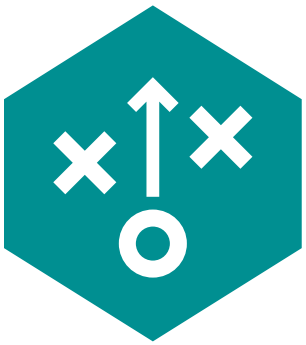

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Race Times for Transgender Athletes

JOANNA HARPER

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Race Times for Transgender Athletes

Joanna Harper, Providence Portland Medical Center, USA

Abstract: In recent years, organizations such as the International Olympic Committee have created regulations to allow those athletes who have undergone gender reassignment to compete in their chosen gender. Despite these rules, there is still a widespread belief that transgender female athletes have an inherent advantage over 46,XX female competitors. Until now, there has not been any published data, based on performances of transgender athletes, to either support or refute this belief. There are two main stumbling blocks to creating such a study: the first is to determine an appropriate metric to examine and the second is to find participants for the study. This study analyzed race times for eight transgender female runners, who have competed in distance races as both male and female, using a mathematical model called age grading. Collectively, the age graded scores for these eight runners are the same in both genders.

Keywords: Transgender, Athletes, Distance Running, Gender, Research

Introduction

Athletes have historically been divided into male and female for the purpose of most sporting competitions. Two components of biological sex, first external genitalia, and later chromosomes were used to make the determination of who was allowed to compete in women's sport. Chromosome testing was initiated for the 1968 Olympics (Elsas et al 2000, 249-254) and thereafter, only those people with XX sex chromosomes among their 23 chromosome pairs, or 46,XX females, were allowed into women's sports. Human biology, however, does not neatly divide into two categories. For instance, some people have neither a 46,XY nor a 46,XX karyotype. Additionally, some people are born with a 46,XY pattern, but with mutations which cause them to be assigned female gender at birth. Chromosome based requirements for participation in female athletics were discontinued in the 1990s (Elsas et al, 249-254), but controversy surrounding athletes with karyotypes other than 46,XX competing in women's sport continues. (Karkazis et al 2012, 3-16).

Transgender people are those whose innate sense of gender, or gender identity, does not match their biological sex. Some transgender people seek gender reassignment. Such people have been termed transsexual, and although the term is descriptive, it is now often viewed unfavorably within the transgender community. While transgender surgery can alter external and internal genitalia, and hormone therapy changes many secondary sex characteristics, neither can alter karyotype; hence it is questionable whether one could claim a change in sex as a result of any intervention. Unambiguous reassignment of gender is, however, possible.

Those who are satisfied with the gender assigned to them at birth can be described as cisgender.

Transgender athletes have sought to compete against other athletes on the basis of their reassigned gender, rather than on their biological sex. While there has been little resistance to the presence of transgender male athletes, sporting organizations were unwilling to allow transgender women to compete against 46,XX women prior to the 21st century. It is notable that in the 1970s, Rene Richards, probably the best-known transgender athlete in history, sued in the United States court system in order to be allowed to play women's tennis (Abrams 2010).

In 2004, the International Olympic Committee (IOC) enacted the Stockholm Consensus (Ljungqvist et al., 2003), that allows transgender women to compete in women's sport once a) gender reassignment surgery had been completed, b) the athlete was legally recognized as female, and c) they had undergone two years of hormone replacement therapy. Transgender men were permitted to compete against cisgender men, although transgender men must file a therapeutic use exception (TUE) form to cover their use of testosterone injections.

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At the time of the Stockholm Consensus, there was no published scientific literature that would justify the inclusion of transgender women. The committee that created the Stockholm consensus relied heavily on information from Dr. Louis Gooren from Amsterdam (Ljungqvist 2104). Dr. Gooren was an expert in transgender studies and would go on to co-author an important paper which studied nineteen transgender women after commencement of hormone therapy (Gooren and Bunck, 2004, 425-429). After one year of testosterone suppression, the subjects had testosterone levels below those of 46,XX women, and hemoglobin levels equal to those of 46,XX women (red blood cell content is very important in endurance sports). Muscle mass differences between the two groups were cut in half. The height of the individuals did not change. There were no additional changes noted at three years. This study was not undertaken on athletes, nor did the researchers directly measure any physical component of athleticism, such as strength, speed, explosiveness, or endurance. The authors concluded that it was reasonable to allow transgender women to compete against cisgender women after appropriate hormone therapy.

It is notable that the Stockholm consensus required two years of hormone therapy, while the published study noted that there were no physical changes in the subjects after one year. This discrepancy was due to conservative estimates given to the committee by Dr Gooren prior to the publication of his study (Ljungqvist 2014).

Many sports followed the lead of the IOC, and in subsequent years there have been transgender women competing in sports such as golf (Mianne Bagger and Lana Lawless), cycling (Natalie Van Gogh, Michelle Dumaresq, and Kristin Worley), martial arts (Nong Toom, and Fallon Fox), and basketball (Gabrielle Ludwig). None of these women has been particularly successful at the highest levels of sport after gender reassignment, and one could argue that this lack of success over ten years would be a strong indication of the fairness of permitting transgender women to compete against cisgender women.

Instead of acceptance, however, there has been a substantial amount of controversy over the presence of transgender women in female athletics. Most people contend that transgender women have an unfair advantage in women's competition (Cavanagh and Sykes, 2006). Opponents of transgender inclusion often point to physical characteristics such as height and hand size, which are not changed by gender reassignment, and suggest that transgender women will always maintain an unfair advantage over cisgender women. These arguments continue today and are not confined to competition at the highest levels. Recently, there were 10,000 emails sent in to protest the decision by the State of Minnesota to allow high school transgender athletes to compete in their chosen gender (Minnesota Star Tribune 2014).

Those in favor of allowing transgender athletic participation inevitably point to the fact that every major sporting organization to look at the issue since 2004 has agreed to allow transgender women to compete against other women. Proponents also will often suggest that science is on their side. However, the only existing published study related to transgender women in sport is the original one by Gooren and Bunk. The science supporting transgender inclusion is very thin indeed.

A thorough literature review of studies applicable to transgender athletes was undertaken for the Canadian Government (Devries, 2008). This review found that "To date no study has conducted any sort of exercise test to assess athletic performance" and concluded that there were no data indicating any sporting advantage or disadvantage for transgender women as compared to over 46,XX women.

The lack of such a study should not come as a surprise. There are two major obstacles involved in compiling any study involving transgender athletes. The first problem is how to formulate a study to create a meaningful measurement of athletic performance, both before and after testosterone suppression. No methodology has been previously devised to make meaningful measurements.

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The second problem is to find study participants. There are few transgender athletes, and even fewer who will want to be identified. In order to create a study, a small cohort of competitive transgender athletes must be found in one given sport. Fortunately, there is mass participation in distance running races throughout much of world. All major cities hold road races with many thousands of runners, giving the sport a large base of adult competitors. Thus, the sport of distance running is an obvious choice to try to find suitable candidates.

In 2011, the international governing body for track and field, the IAAF, amended its rules to allow anyone who was legally and hormonally female to compete in the women's category (IAAF, 2011). The portion of the ruling applicable to transgender women lists no requirement for surgical intervention, or specific duration of hormone therapy. It does require an endocrine evaluation prior to any declaration of eligibility. In many parts of the world, legal gender reassignment is not allowed, and this will be a barrier to participation for many transgender athletes.

In 2012, the IOC also adopted a testosterone-based rule for eligibility for women's sport (IOC, 2012); however, the IOC maintained their previous rules pertaining to transgender women. Hence, it would be possible for a transgender woman to compete against other women in the IAAF sponsored 2015 world track championships, but not be eligible to do so in the IOC-sponsored 2016 Olympics.

Methods

Race times from eight transgender women runners were collected over a period of seven years and, when possible, verified. The collection process consisted of seeking out female transgender distance runners, mostly online, and then asking them to submit race times. Even in 2014 few people are open about being transgender, so the submission of race times represented a large leap of faith for the participants. When possible, race times were then verified using online services listing race results. For six of the eight runners, online checking made it possible to verify approximately half of the submitted times. Two of the subjects, runners three and four, would only participate anonymously, creating an ethical dilemma over the use of their times, versus respect their privacy.

Seven of the eight subjects experienced a substantial reduction in running speed upon transition. There are a few methods of comparing men's and women's race times. The simplest involves the well-known approximation that men will, on average, run 10% faster than women (Berman et al. 2013 63–65). There are a couple of other comparison methods as well, but there is only one method that also factors in age. Correcting for age is important because most of the runners in the study were more than 30 years old, and would be faced with declining performance as they grew older, following their gender transition.

Age grading (Grubb, 1998, 509-521) is a method of comparing the performance of athletes of all ages and both sexes. For running events, the athlete's race time (RT) is compared to the fastest time ever run by a person of that age and sex, or the age standard (AS). The resultant age grade (AG) percentage is obtained by the following formula:

$$AG\ (\%) = (AS \times 100) / RT$$

All times are measured in seconds.

In order to understand how age grading works, let's examine two forty-year-old runners who run a 5-kilometer race (5k). The male runner runs 19:30 (1170 seconds). In order to determine his age grade, one compares his time to the fastest time ever run by a forty-year-old male 5k runner, i.e. 13:39 (819 seconds). The equation becomes

$$AG = (819 \text{ seconds} \times 100)/1170 \text{ seconds} = 70$$

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and our male runner gets a score of 70.

The female runner has a time of 21:51 (1311 seconds) and her time is compared to the fastest ever time by a forty-year-old woman, i.e. 15:18 (918 seconds). The equation for her AG is

AG = (918 seconds x 100) /1311 seconds = 70

Thus, our male and female runners score the same age grade despite the fact that the male ran more than two minutes faster than the female did. This is fair. Men run faster than women. The two runners are both well above average runners for their age and sex, and deserve to receive equal accolades.

Age grading has become the standard way of comparing performances by older track and field athletes of both sexes. The method has also been rigorously evaluated and improved, specifically with regard to the curve fitting that is needed to connect the age standards associated with different ages. Mathematician Alan Jones (Jones 2010) has made significant improvements to the age-graded tables that Howard Grubb developed in the 1990s.

Results

Collectively, the eight runners had much slower race times in the female gender than as males. Time differences were, in fact, so great, that age graded performances stayed virtually constant for the group. Tables one through four summarize the data from all eight runners over four frequently run race distances varying from 5k to the marathon (42 kilometers). Not all eight women submitted times for all four of these distances.

Table 1: 5k Race Times

	Male	Races		Female	Races	
Runner No.	**Age**	**Time**	**AG**	**Age**	**Time**	**AG**
One	48	18:27	78.7	52	22:43	75.7
Two	30	15:56	81.4	36	17:51	82
Four (a)	30	17:35	73.6	33	21:04	70.6
Five	34	19:39	66.7	35	23:43	63
Six (b)	24	15:07	83.5	53	20:22	85.5
Eight	27	20:29	62.2	30	22:51	64.8

Table 2: 10k Race Times

	Male	Races		Female	Races	
Runner No.	**Age**	**Time**	**AG**	**Age**	**Time**	**AG**
One	49	0:39:05	77.9	56	0:48:45	76.1
Two (b)	22	0:32:37	82.4	36	0:36:58	83.1
Five	34	0:45:33	60.1	36	0:57:40	53.3
Six (a)	46	0:37:10	80	48	0:42:01	80.5

Table 3: Half-marathon Race Times

	Male	Races		Female	Races	
Runner No.	**Age**	**Time**	**AG**	**Age**	**Time**	**AG**
Five	33	1:53:06	52.4	37	2:05:38	53.3
Six (b) (d)	26	1:08:38	86.3	53	1:32:27	83.8
Six (a) (d)	46	1:23:11	77.8	48	1:34:01	77.5
Seven (c)	19	1:48:47	55.7	28	1:48:45	60.5

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Table 4: Marathon Race Times

	Male	Races		Female	Races	
Runner No.	**Age**	**Time**	**AG**	**Age**	**Time**	**AG**
Three	49	3:18:58	69.5	54	4:12:31	67.2
Five	34	3:16:59	63.4	35	4:08:33	55.3
Seven (c)	19	3:49:55	55.7	31	2:59:10	75.7
Eight	29	3:08:53	66.1	30	3:44:55	60.2

Notes

(a) These races were run over the same course within three years' time and represent the best comparison points.

(b) Races compared over a long time period have more uncertainty associated with them, but both runner two and runner six reported stable training patterns over this time range. These races also help to confirm the age-grading methodology for tracking progress of a runner over the course of a multi-year time frame.

(c) Runner seven represented the biggest evaluation challenge. She raced as a 19 year-old male recreational runner and then resumed running years later as a female. She got serious about the sport after she resumed, doubled her training load and dropped 10 kg of weight. Not surprisingly, she got faster. This improvement can be seen in the fact that her AG went from 60.5 at age 28 to 75.7 at age 31 (both in female gender). This 15 point change in age grade was much larger than the 5-point change she experienced after transition from male to female.

(d) It is useful to compare times for the same runner over different race courses and at different time periods. The two lower scores occurred on a hilly course at a period of average fitness for runner six. The two higher scores were on flat courses at times of peak fitness.

Table five indicates the average AGs from all eight runners in each gender and the overall averages of all eight.

Table six shows the highest AGs from each runner and the average of these highest AGs. Two tailed t tests were run on both the mean and peak AGs. The p values were p=0.84 for the average AGs and p=0.68 for the highest AG. A p value of less than 0.05 is needed for the values to be considered significantly different, and these p values are very much higher.

Table 5: Average Age Grades

	Average male AG	Average female AG
Runner 1	75.2	77.1
Runner 2	81.8	82.8
Runner 3	69.5	70.8
Runner 4	71.4	64.8
Runner 5	57.7	49.3
Runner 6	83.8	81.9
Runner 7	55.7	61.9 (e)
Runner 8	54.3	59.1
Average	68.7	68.5

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Table 6: Highest Age Grade

	Highest male AG	Highest female AG
Runner 1	78.7	79.2
Runner 2	82.9	83.2
Runner 3	69.5	74.3
Runner 4	74.1	74.1
Runner 5	66.7	63.0
Runner 6	87.5	85.6
Runner 7	55.7	63.4 (e)
Runner 8	66.1	64.8
Average	72.7	73.4

(e) The 2:59 marathon time by runner seven was considered an outlier, the result of her substantially altered training and was not used in these tables.

Discussion

The majority of scientists believe that testosterone is primarily responsible for the difference in athletic results between the sexes (Bermon et al. 2014, 4328–4335), although there are dissenters (Healy et al. 2014, 294-303). There have been multiple studies on men's and women's testosterone levels with some variation in results, but a typical set of values would be as follows: Men's range — 10 to 35 nmol/l; female range — 0.35 to 2.0 nmol/l (Haring et al. 2012, 408–415).

Transgender women who have undertaken testosterone suppression change from normal male testosterone levels to normal female levels, in fact, after surgery their testosterone levels are below the mean for 46,XX women (Gooren and Bunck, 425–429). Largely as a result of their vastly reduced testosterone levels, transgender women lose strength, speed, and virtually every other component of athletic ability.

Since this study looks at endurance capabilities of athletes both pre and post testosterone suppression, it is also of significant interest to look at hematocrit or hemoglobin levels of transgender women. One year after testosterone suppression, hemoglobin levels in transgender women fell from 9.3 mmol/l to 8.0 mmol/l. This latter number is statistically identical to the mean hemoglobin level for cisgender women (Gooren and Bunck 425–429).

The reduction of testosterone and hemoglobin levels of transgender women after transition would suggest that endurance capabilities of transgender women athletes should be similar to those of 46,XX women.

The difficulty of finding suitable subjects is underscored by the fact that it took seven years to amass data from eight participants.

The times submitted by the eight runners were self-selected and self-reported. The self-reporting by the subjects certainly affects the strength of the findings. As mentioned previously, almost half of the race times were double checked by the author for accuracy. None of the subjects incorrectly reported any result.

Collectively, the eight runners were much slower in the female gender; slow enough, in fact, that their age graded performances were almost identical to their male AGs. Two of the runners had higher average AGs in male gender than in female gender, while one runner had higher female AGs than male ones. The changes in the age grades of these runners mirrored changes in their training habits.

After transition, runner four began to experience a significant number of injuries which prevented her from training as rigorously as she previously had. It is not surprising that her results got worse as time went on. Runner five experienced both weight gain and a loss

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motivation in the years after her transition. In fact her motivation declined to the point that she gave up racing not long after the submission of her results.

On the other hand, runner seven blossomed as a runner after transition. Eventually, she doubled her weekly training distance. She also lost approximately 10 kg of body mass after she started to train harder. It is not surprising that her times and age grade scores showed a subsequent improvement.

The other runners in the study reported relatively stable training loads in both male and female mode, and this is reflected in their more stable age grades in both genders.

Since training loads vary over time for all runners, the author believes that highest age grade might be the best comparison of male versus female athletic potential. But, whether one uses average or highest age grades, the subjects scored statistically identical age grades both as male and as female.

It is significant to note that none of the eight subjects was a truly elite runner. An optimal study would use world-class runners and the results could be used to justify the presence of transgender women in events such as the Olympic Games. Unfortunately, there simply are no world-class transgender distance runners. Three of the eight runners have achieved notable success at the national level, and two of the other runners could be described as sub-elite. Resistance to the presence of transgender women occurs at all levels of sport, and so there is still much merit to the study.

One interesting trend was noted in runners five, six and eight, who age graded higher in shorter events as women than they did in longer events. Runners six and eight scored higher age grades in 5k races than they did as males but lower AGs in longer races – half marathon and up. Runner five scored lower across the board as female than as male but her 5k AGs were much closer to her male ones, than her marathon AGs were. Transgender women carry more muscle mass than 46,XX women (Gooren and Bunck 2004, 425–429). This extra muscle mass might cause increased speed when compared to cisgender women, and hence faster times and higher AGs at shorter distances. Increased muscle mass and heavier bones are not conducive to long distance running, and would actually be a disadvantage when running distances of a half marathon and higher, causing slower times and lower AGs. This effect is small in the three mentioned runners, and none of the other five runners submitted data over a wide enough range of distances to determine whether or not this pattern held true for them; more research would be needed to confirm or refute the hypothesis of distance related variations in age grade scores for transgender women.

It should be noted that these results are only valid for distance running. Transgender women are taller and larger, on average, than 46,XX women (Gooren and Bunck, 2004, 425-429), and these differences probably would result in performance advantages in events in which height and strength are obvious precursors to success - events such as the shot put and the high jump. Conversely, transgender women will probably have a notable disadvantage in sports such as gymnastics, where greater size is an impediment to optimal performance.

The Grubb and Jones age-grading methodology applies only to track-and-field and distance running, but, it should be possible to create a similar analytic method to compare results for other sports, such as swimming, weightlifting, or ski-jumping, which also measure results in times, distances or weights – the so called CGS (centimeter, grams, and seconds) sports. It would be very difficult, however, to devise such a method to analyze performances in most other types of sports.

Conclusions

Despite the fact that transgender women have been allowed to compete against cisgender ones since 2004, there has been no study used to justify this decision beyond the original work of Gooren and Bunck. It bears repeating that this original study was not undertaken on athletes, nor

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did it directly measure any aspect of athleticism. In fact, this is the first time a study has been developed to measure the performance of transgender athletes. The author overcame two significant barriers which have prevented any previous study from being performed, i.e. the difficulty in determining an appropriate metric to measure athletic performance both before and after testosterone suppression, and the difficulty in finding enough willing study participants in any given sport.

The author chose to use the standard age-grading methodology which is commonly used in master's (over forty) track meets worldwide, to evaluate the performance of eight distance runners who had undergone gender transition from male to female. As a group, the eight study participants had remarkably similar age grade scores in both male and female gender, making it possible to state that transgender women run distance races at approximately the same level, for their respective gender, both before and after gender transition.

It should be noted that this conclusion only applies to distance running and the author makes no claims as to the equality of performances, pre and post gender transition, in any other sport. As such, the study cannot, unequivocally, state that it is fair to allow to transgender women to compete against 46,XX women in all sports, although the study does make a powerful statement in favor of such a position.

It should also probably be noted that the publication of this study will likely not appreciably change the resistance faced by transgender women who compete against cisgender ones. There will continue to be strong opposition by athletes, parents and fans to the inclusion of transgender women. It will take many more years before the average sports enthusiast understands that transgender women who have undergone testosterone suppression will not dominate women's sports.

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UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF IDAHO

LINDSAY HECOX, et al.,

Plaintiffs,

v.

BRADLEY LITTLE, et al.,

Defendants.

No. 1:20-cv-184-CWD

EXPERT DECLARATION OF JOSHUA D. SAFER, MD, FACP, FACE, IN SUPPORT OF PLAINTIFFS' MOTION FOR PRELIMINARY INJUNCTION

I, Joshua D. Safer, MD, FACP, FACE, have been retained by counsel for Plaintiffs Lindsay Hecox and Jane Doe, with her next friends, Jean Doe and John Doe, as an expert in connection with the above-captioned litigation.

1. The purpose of this declaration is to offer my expert opinion on: (1) medical and scientific concepts relevant to the attempted regulation of transgender and intersex girls and women playing sports; (2) policies of elite athletic organizations in limiting eligibility to compete in women's sports, including based on serum testosterone levels; (3) policies in non-elite contexts regarding eligibility to compete in women's sports; (4) the questions that have arisen when entities have attempted to define a person's sex for purposes of competing in women's sports; and (5) whether the available scientific evidence supports the assertion that transgender girls and women have an unfair "athletic advantage" if they compete in girls' and women's athletics in different contexts.

2. In preparing this declaration, I reviewed the legislative findings for H.B. 500, as enacted, and the sources cited therein.

3. I have knowledge of the matters stated in this declaration and have collected and cite to relevant literature concerning the issues that arise in this litigation in the body of this declaration and in the attached bibliography.

4. In preparing this declaration, I relied on my scientific education and training, my research experience, and my knowledge of the scientific literature in the pertinent fields. The materials I have relied upon in preparing this declaration are the same types of materials that experts in my field of study regularly rely upon

when forming opinions on the subject. I may wish to supplement these opinions or the bases for them as a result of new scientific research or publications or in response to statements and issues that may arise in my area of expertise.

PROFESSIONAL BACKGROUND

5. I am a Staff Physician in the Endocrinology Division of the Department of Medicine at the Mount Sinai Hospital and Mount Sinai Beth Israel Medical Center in New York, NY. I serve as Executive Director of the Center for Transgender Medicine and Surgery at Mount Sinai. I also hold an academic appointment as Professor of Medicine in Mount Sinai's Icahn School of Medicine. A true and correct copy of my CV is attached hereto as Exhibit A.

6. I have been Board Certified in Endocrinology, Diabetes and Metabolism by the American Board of Internal Medicine since 1997.

7. I graduated from the University of Wisconsin in Madison with a Bachelor of Science degree in 1986. I earned my Doctor of Medicine degree from the University of Wisconsin in 1990. I completed intern and resident training at Mount Sinai School of Medicine, Beth Israel Medical Center in New York, New York from 1990 to 1993. From 1993 to 1994, I was a Clinical Fellow in Endocrinology at Harvard Medical School and Beth Israel Deaconess Medical Center in Boston, Massachusetts. I stayed at the same institution, serving as a Clinical and Research Fellow in Endocrinology under Fredric Wondisford, from 1994 to 1996.

8. Since 1997, I have evaluated and treated patients along with conducting research in endocrinology. Since 2004, my patient care and research has

been focused on the medicine/science specific to transgender individuals. I have led several other programs either in transgender medicine or in general endocrinology. In particular, I served as the Medical Director of the Center for Transgender Medicine and Surgery, Boston Medical Center, Boston, MA (2016-2018); as the Director of Medical Education, Endocrinology Section, Boston University School of Medicine, Boston, MA (2007-2018); as the Program Director for Endocrinology Fellowship Training, Boston University Medical Center, Boston, MA (2007-2018); and as Director of the Thyroid Clinic, Boston Medical Center, Boston, MA (1999-2003).

9. I have authored or coauthored over 100 peer-reviewed papers including many critical reviews; textbook chapters; and case reports in endocrinology and transgender medicine.

10. Among my publications are the latest review of transgender medicine in the New England Journal of Medicine and the latest review of transgender medicine in the Annals of Internal Medicine. *See* Safer JD, Tangpricha V. Care of transgender persons. *N Engl J Med* 2019; 381:2451-2460; Safer JD, Tangpricha V. Care of the transgender patient. *Ann Intern Med* 2019; 171:ITC1-ITC16. I am also a co-author of the sections of UpToDate which relate to gender-affirming hormone treatment for transgender people. UpToDate is an evidence-based, physician authored on-line medical guide and is currently the most widely used such guide among medical providers.

11. I was the inaugural President of the United States Professional Association for Transgender Health ("USPATH"). I am also Secretary and Co-Chair of the Steering Committee of TransNet, the International Consortium for Transgender Medicine and Health Research. I have served in several other leadership roles in professional societies related to endocrinology and transgender health. These societies include the Alliance of Academic Internal Medicine, the American College of Physicians Council of Subspecialty Societies, the American Board of Internal Medicine, the Association of Program Directors in Endocrinology and Metabolism, and the American Thyroid Association.

12. Since 2014, I have held various roles as a member of the World Professional Association for Transgender Health ("WPATH"), the leading international organization focused on transgender health care. WPATH has approximately 2,000 members throughout the world and is comprised of physicians, psychiatrists, psychologists, social workers, surgeons, and other health professionals who specialize in health care for transgender individuals. From 2016 to the present I have served on the Writing Committee for Standards of Care for the Health of Transsexual, Transgender, and Gender Nonconforming People.

13. I have served in various roles as a member of the Endocrine Society since 2014. I served as a Task Force member to develop the Endocrine Treatment of Transgender Persons Clinical Practice Guideline from 2014 to 2017. As part of this task force of nine experts, a methodologist, and a medical writer, I co-authored the "Endocrine Treatment of Gender-Dysphoria/Gender Incongruent Persons: An

Endocrine Society Clinical Practice Guideline," ("Endocrine Society Guidelines"), available at https://academic.oup.com/jcem/article/102/11/3869/4157558.

14. I have served as a Transgender Medicine Guidelines Drafting Group Member for the International Olympic Committee ("IOC") since 2017.

15. I have also served since 2019 as a drafting group member of the transgender medical guidelines of World Athletics, formerly known as the International Amateur Athletic Federation ("IAAF").

16. I have not previously testified as an expert witness in either deposition or at trial. I am being compensated at an hourly rate of $250 per hour for preparation of expert declarations and reports, and $400 per hour for time spent preparing for or giving deposition or trial testimony. My compensation does not depend on the outcome of this litigation, the opinions I express, or the testimony I provide.

RELEVANT MEDICAL AND SCIENTIFIC BACKGROUND

17. "Gender identity" is the medical term for a person's internal, innate sense of belonging to a particular sex/gender. *See* Endocrine Society Guidelines, Tbl.1 *and* Safer JD, Tangpricha V. Care of transgender persons. *N Engl J Med* 2019; 381:2451-2460, Tbl.1.

18. Although the detailed mechanisms are unknown, there is a medical consensus that there is a significant biologic component underlying gender identity. Safer JD, Tangpricha V. Care of transgender persons. *N Engl J Med* 2019; 381:2451-2460; Safer JD, Tangpricha V. Care of the transgender patient. *Ann*

Intern Med 2019; 171:ITC1-ITC16. An individual's gender identity is durable and cannot be changed by medical intervention.

19. "Gender" is an imprecise term that can cause confusion and should be avoided for the sake of clarity. The term "gender" is sometimes used interchangeably with the term "sex." In addition, the term "gender" is sometimes used as shorthand for "gender identity" and sometimes used as shorthand for "gender roles" and "gender expression." But "gender identity," "gender roles" and "gender expression" are different things.

20. Gender roles are behaviors, attitudes, and personality traits that a society (in a given culture and historical period) designates as masculine or feminine and/or that society associates with or considers typical of the social role of men or women. *See* Endocrine Society Guidelines Tbl.1. The convention that girls wear pink and have longer hair, or that boys wear blue and have shorter hair, are examples of socially constructed gender roles.

21. By contrast, "gender identity" does not refer to a set of socially contingent behaviors, attitudes or personality traits that a society designates as masculine or feminine. It is largely a biological phenomenon.

22. Gender expression is how a person communicates gender identity to others. *See* Safer JD, Tangpricha V. Care of transgender persons. *N Engl J Med* 2019; 381:2451-2460, Tbl.1. For example, a person with a female gender identity might express her identity through typically feminine outward expressions of gender like by wearing longer hair or more typically feminine clothing.

23. The phrase "biological sex" is an imprecise term that can cause confusion. A person's sex encompasses the sum of several different biological attributes, including sex chromosomes, certain genes, gonads, sex hormone levels, internal and external genitalia, other secondary sex characteristics, and gender identity. Those attributes are not always aligned in the same direction. *See* Endocrine Society Guidelines; Safer JD, Tangpricha V. Care of transgender persons. *N Engl J Med* 2019; 381:2451-2460.

24. Before puberty, boys and girls have the same levels of circulating testosterone. After puberty, the typical range of circulating testosterone for non-transgender women is similar to before puberty (<1.7 nmol/L), and the typical range of circulating testosterone for non-transgender men is 9.4-35 nmol/L. *See* Endocrine Society Guidelines (p 3888) *and* Safer JD, Tangpricha V. Care of transgender persons. *N Engl J Med* 2019.

25. Based on research comparing non-transgender pubertal and post-pubertal boys and men with non-transgender pubertal and post-pubertal girls and women, there is a medical consensus that the difference in testosterone is generally the primary known driver of differences in athletic performance between elite male athletes and elite female athletes. *See* Handelsman DJ, et al. Circulating testosterone as the hormonal basis of sex differences in athletic performance. *Endocrine Reviews* 2018; 39:803-829, (p 803).

26. Even though there are ranges of testosterone that are considered typical for non-transgender men and women, many non-transgender women have testosterone outside the typical range.

a. Approximately 6% to 10% of women have a condition called polycystic ovary syndrome (PCOS), which can raise women's testosterone levels up to 4.8 nmol/L.

b. Some women have "46,XY DSDs," a group of conditions where individuals have XY chromosomes but are born with typically female external genitalia and assigned a female sex at birth. Among individuals with 46,XY DSD some may have inactive testosterone receptors (a syndrome called "complete androgen insensitivity syndrome, CAIS") which means they don't respond to testosterone despite very high levels. Typically, these individuals have female gender identity and have external genitalia that are typically female. They do not develop the physical characteristics associated with typical male puberty.

c. Other individuals with 46,XY DSD may have responsive testosterone receptors. These individuals may have female gender identity but at puberty they may start to develop higher levels of testosterone along with secondary sex characteristics that are typically masculine.

WORLD ATHLETICS AND IOC POLICIES FOR WOMEN WITH HYPERANDROGENISM

27. Beginning in 2011, World Athletics (then known as IAAF) began requiring that women with elevated levels of circulating testosterone lower their

levels of testosterone below a threshold amount in order to compete in women's sports. Under the 2011 regulations, women with hyperandrogenemia (defined as serum testosterone levels above the normal range) were allowed to compete only if they demonstrated that they had testosterone levels below 10 nmol/L or that they had CAIS, preventing their bodies from responding to testosterone.

28. In 2014, the Court of Arbitration for Sport (CAS) suspended the IAAF regulations. CAS accepted the IAAF position that testosterone is a key factor for competitive athletic advantage but asked the IAAF to provide additional evidence to demonstrate that differences were relevant at the levels of testosterone being considered for determination of eligibility in the women's category of competition.

29. The IAAF then issued revised regulations in 2018 after a study that showed a significant improvement in athletic performance among women with higher testosterone levels for some sports. *See* Bermon S, Garnier P-Y. Serum androgen levels and their relation to performance in track and field: mass-spectrometry results from 2127 observations in male and female elite athlete. *Br J Sports Med* 2017; 51:1309-1314.

30. The regulations also lowered the maximum testosterone threshold to 5 nmol/L.

31. The revised regulations were upheld by the Court of Arbitration for Sport in 2019.

WORLD ATHLETICS AND IOC POLICIES FOR TRANSGENDER WOMEN

32. Formal eligibility rules for the participation of transgender women in the Olympics were published in 2003. The rules required that transgender women athletes could compete in women's events only if they had genital surgery, a gonadectomy, and legal documentation of sex.

33. However, many transgender women are treated with medicines alone and don't have gonadectomy. As well, many jurisdictions do not have systems to document the sex of transgender people. In some jurisdictions, being transgender is illegal, and revelation that someone is transgender can be unsafe.

34. Therefore, in 2015, the IOC adopted new guidance modeled after the IAAF's 2011 regulations for non-transgender women with hyperandrogenism. Under the new IOC guidance, transgender women must demonstrate that their total testosterone level in serum has been below 10 nmol/L for at least one year prior to competition. The 10 nmol/L threshold was the same threshold set by the IAAF's 2011 regulations.

35. In 2019, the IAAF adopted regulations based on the IOC guidance except that the testosterone threshold level was lowered to 5 nmol/L, which was the same threshold set by the IAAF's 2018 regulations for non-transgender women with hyperandrogenism that had been upheld by the CAS when contested.

36. The IOC and IAAF rules are consistent with the Endocrine Society Guidelines for the treatment of transgender women, which recommend that transgender women treated with hormone therapy target circulating testosterone

levels to a typical female range at or below 1.7 nmol/L (Endocrine Society Guidelines, p 3887) and with the study of testosterone levels achieved by medically treated transgender women in practice (Liang JJ, et al. Testosterone levels achieved by medically treated transgender women in a United States endocrinology clinic cohort. *Endocrine Practice* 2018; 24:135-142).

TRANSGENDER AND INTERSEX ATHLETES IN NON-ELITE CONTEXTS

37. The policies developed by World Athletics and the IOC for transgender athletes were based on the particular context of elite international competition. Not all of the same considerations apply in other contexts.

38. Most of the athletes competing in elite international competitions have already completed puberty. But in high school, athletes' ages could typically range from 14-18, with different athletes in different stages of pubertal development. Increased testosterone begins to affect athletic performance at the beginning of puberty, but those effects continue to increase each year of puberty until about age 18, with the full impact of puberty resulting from the cumulative effect of each year. As a result, testosterone provides less of an impact for a 14, 15, or 16-year old than it does for a 17 or 18-year old. The concerns that animated the World Athletics and IOC policies are more attenuated at the high school or junior high school level.

39. The NCAA allows transgender women to participate on the same teams as other women after one year of testosterone suppression as part of gender transition. The NCAA policy does not require ongoing testosterone testing, which is required at the elite levels. Under the NCAA policy, which has been in effect since

2011, transgender student-athletes certify that they have been on hormone therapy for a period of one year.

40. Unlike in scholastic contexts in the United States, World Athletics and the IOC have to develop policies that cannot be manipulated by different governments that are not bound by the rule of law. For example, there have been many well-known examples of state-sponsored doping scandals. The Russian Olympic team is currently banned from international competition due to an organized doping effort.

IDAHO'S EFFORTS TO BAR ATHLETIC COMPETITION BY TRANSGENDER WOMEN AND GIRLS

41. Under the newly passed Idaho law, an individual whose sex is disputed for purposes of competing in athletic activities for women and girls is instructed to "verify the student's biological sex" by providing a signed physician statement after an examination relying only on one or more of the following: the student's reproductive anatomy, genetic makeup, or normal endogenously produced levels of testosterone. None of these physiological characteristics alone or in any combination can "verify" sex, nor are any of them alone or in any combination accurate proxies for athletic advantage.

42. As noted above, one does not verify sex by a examining these characteristics, alone or in combination. A person's sex is made up of multiple biological characteristics and they may not all align as typically male or female in a given person.

43. A person's genetic make-up and internal and external reproductive anatomy are not useful indicators of athletic performance and have not been used in elite competition for decades.

44. A blood test is generally used to test circulating testosterone. The blood test does not distinguish between exogenous and endogenous testosterone. Exogenously administered testosterone can be identified with a urine test. However, the urine test will only determine that there is current use of exogenous testosterone. The urine test is not relevant when the person is not taking exogenous testosterone. The urine test will not measure what endogenous testosterone levels would be absent suppression. For a person suppressing testosterone as part of a medically prescribed treatment plan for gender dysphoria, neither blood testing nor urine testing would specify testosterone levels without suppression. There is no way to test for "normally produced" endogenous testosterone without taking people off of prescribed medication, which would be dangerous.

45. Though the IOC, World Athletics, and the NCAA require certain athletes with higher levels of endogenous testosterone to suppress their levels or at least undergo testosterone suppression treatment in order to compete in women's athletics, Idaho's new rule creates an outright bar based on endogenous testosterone without even specifying the endogenous serum testosterone level that one would need to demonstrate to "verify" sex. Under the Idaho rule, no amount of reduction of one's testosterone level could ever be adequate. Further, as noted above, people without active testosterone receptors experience none of the athletic

impact of the hormone despite having high levels of circulating testosterone. They too would appear to be disqualified under Idaho's rule.

46. The legislative findings for H.B. 500 contend that even after receiving gender-affirming hormone therapy, women and girls who are transgender have "an absolute advantage" over non-transgender girls. This assertion is based on speculation and inferences that have not been borne out by any evidence.

47. First, these arguments overlook the population of transgender girls and women who, as a result of puberty blockers at the start of puberty and gender affirming hormone therapy afterward, never go through a typical male puberty at all. These girls never experience the effects of high levels of testosterone and accompanying physiological changes. They go through puberty with the same levels of hormones as other girls and develop typically female physiological characteristics, including muscle and bone structure. Idaho's law would bar them from participation in female athletics with absolutely no medical or scientific basis even based on the standards set forth in the legislative findings.

48. A transgender woman who has not gone through a typical male puberty is similarly situated to a woman with XY chromosomes who has complete androgen insensitivity syndrome, and it has long-been recognized that women with CAIS have no athletic advantage simply by virtue of having XY chromosomes. *See also* Handelsman DJ, et al. Circulating testosterone as the hormonal basis of sex differences in athletic performance. *Endocrine Reviews* 2018; 39:803-29, (p 820,

summarizing evidence rejecting hypothesis that physiological characteristics are driven by Y chromosome).

49. The legislative findings also state that "benefits that natural testosterone provides to male athletes is not diminished through the use of puberty blockers and cross-sex hormones." This is not true. As noted above, puberty blocking treatment completely blocks the production of testosterone and someone who has undergone both puberty blocking treatment and then gender affirming hormone therapy to initiate puberty consistent with gender identity would have none of the impacts of testosterone on the body that would be typical for a non-transgender male. It is also not true that gender-affirming therapy – even for those who have not undergone puberty blocking treatment – does nothing to minimize the impact of testosterone on the body. In fact, consistent use of testosterone blockers and estrogen has a significant impact on the body.

50. The legislative findings also note that "Men generally have 'denser, stronger bones, tendons, and ligaments' and 'larger hearts, greater lung volume per body mass, a higher red blood cell count, and higher hemoglobin" and suggest that such characteristics lead to athletic advantage and cannot be altered by sustained gender-affirming hormone therapy. However, the noted higher red blood cell count and higher hemoglobin are both testosterone dependent. They are both reduced as part of sustained gender-affirming hormone therapy. And there is currently no evidence that the remaining noted physiological characteristics actually are

advantages when not accompanied by high levels of testosterone and corresponding skeletal muscle.

51. The only study examining the effects of gender-affirming hormone therapy on the athletic performance of transgender female athletes is a small study of eight long-distance runners. The study showed that after undergoing gender-affirming interventions, which included lowering their testosterone levels, the athletes' performance had reduced so that relative to non-transgender women their performance was now proportionally the same as it had been relative to non-transgender men prior to any medical treatment. In other words, a transgender woman who performed at about 80% as well as the best performer among men of that age before transition would also perform at about 80% as well as the best performer among women of that age after transition. *See* Harper J. Race times for transgender athletes. *Journal of Sporting Cultures and Identities* 2015; 6:1-9.

52. In fact, it may be that some of the body changes from endogenous puberty result in poorer net performance for transgender women relative to cisgender women.

53. For example, the fact that transgender women who go through typically male puberty will tend to have larger bones than non-transgender women may actually be a *disadvantage*. Having larger bones without corresponding levels of testosterone and muscle mass would mean that a runner has a bigger body to propel with less power to propel it.

54. Similarly, in a sport where athletes compete in different weight classes (*e.g.* weight lifting), the fact that a transgender woman has bigger bones may be a disadvantage because her ratio of muscle-to-bone will be much lower than the ratio for other women in her weight class who have smaller bones.

55. Even if it could be demonstrated that larger bones or lungs can slightly enhance the athletic performance of transgender women even after they lower their level of testosterone, that finding would have to be placed in context. Larger lungs and hearts generally correlate to a person's size, so there are significant intra-sex variations of heart and lung size even among women who are not transgender.

56. There are also myriad genetic variations among athletes that can enhance athletic performance. In the academic literature these are referred to as "performance enhancing polymorphisms" or "PEPs." A PEP is a variation in the DNA sequence that is associated with improved athletic performance. For example, variations in mitrochondrial DNA have been associated with greater endurance capacity and greater mitochondrial density in muscles. Other PEPs are associated with blood flow or muscle structure. *See* Ostrander EA, et al. Genetics of athletic performance. *Annu Rev Genomics Hum Genet* 2009; 10:407-429. These variations have proven to have a significant impact on athletic ability, unlike bone or lung size in transgender women.

57. After a transgender woman lowers her level of testosterone, there is no inherent reason why her physiological characteristics related to athletic

performance should be treated differently from the physiological characteristics of a non-transgender woman.

I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

Executed on April 24, 2020

Joshua D. Safer, MD, FACP, FACE

BIBLIOGRAPHY

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Bhasin S, et al. Testosterone dose-response relationships in health young men. *Am J Physiol Endocrinol Metab* 2001; 281:E1172-E1181.

Hagmar M, et al. Hyperandrogenism may explain reproductive dysfunction in Olympic athletes. *Med Sci Sports Exercise* 2009; 41:1241-1248.

Handelsman DJ, et al. Circulating testosterone as the hormonal basis of sex differences in athletic performance. *Endocrine Reviews* 2018; 39:803-829.

Harper J. Race times for transgender athletes. *Journal of Sporting Cultures and Identities* 2015; 6:1-9.

Hembree WC, et al. Endocrine treatment of gender-dysphoria/gender incongruent persons: An Endocrine Society clinical practice guideline. *J Clin Endocrinol Metab* 2017; 102: 3869–3903.

Liang JJ, et al. Testosterone levels achieved by medically treated transgender women in a United States endocrinology clinic cohort. *Endocrine Practice* 2018; 24:135-142.

Ostrander EA, et al. Genetics of athletic performance. *Annu Rev Genomics Hum Genet* 2009; 10:407-429.

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Safer JD, Tangpricha V. Care of transgender persons. *N Engl J Med* 2019; 381:2451-2460.

Wiik A, et al. Muscle strength, size and composition following 12 months of gender-affirming treatment in transgender individuals. *J Clin Endocrinol Metab* 2020; 105:1-9.

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on the 30th day of April, 2020, I filed the foregoing electronically through the CM/ECF system, which caused the following parties or counsel to be served by electronic means, as more fully reflected on the Notice of Electronic Filing:

Dan Skinner
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Individual members of the State Board of Education,
Boise State University,
Marlene Tromp,
Individual members of the Idaho Code Commission

DATED this 30th day of April, 2020.

/s/ Richard Eppink

EXHIBIT A

CURRICULUM VITAE

Joshua D. Safer, MD, FACP, FACE
March 26, 2020
Office Address: 17 East 102nd Street, Room D-240
New York, NY 10029
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Academic Training

1990	MD	University of Wisconsin School of Medicine, Madison, WI
1986	BS	University of Wisconsin, Madison, WI, Economics

Postdoctoral Training

1994 - 1996	Clinical and Research Fellow, Endocrinology, under Fredric Wondisford, Harvard Medical School - Beth Israel Deaconess Medical Center, Boston, MA
1993 - 1994	Clinical Fellow, Endocrinology, Harvard Medical School and Beth Israel Deaconess Medical Center, Boston, MA
1990 - 1993	Intern and Resident, Department of Medicine, The Mount Sinai School of Medicine, Beth Israel Medical Center, New York City, NY

Academic Appointments

2019 - present	Professor of Medicine, Icahn School of Medicine at Mount Sinai, New York, NY
2006 - 2018	Associate Professor of Medicine and Molecular Medicine, Boston University School of Medicine
1999 - 2005	Assistant Professor of Medicine, Boston University School of Medicine
1996 - 1999	Instructor in Medicine, Harvard Medical School
1993 - 1996	Fellow in Medicine, Harvard Medical School

Hospital Appointments

2018 - present	Staff Physician, The Mount Sinai Hospital, New York City, NY
2018 - present	Staff Physician, Mount Sinai Beth Israel Medical Center, New York City, NY
1999 - 2018	Staff Physician, Boston University Medical Center, Boston, MA
2001 - 2006	Staff Physician, Veterans Administration Boston Health Care, Boston, MA
1996 - 1999	Staff Physician, Beth Israel Deaconess Medical Center, Boston, MA
1990 - 1993	House Staff, Beth Israel Medical Center, New York City, NY

Other Medical Staff Appointments

2004 - 2013	Staff Physician, Massachusetts Institute of Technology Medical, Cambridge, MA
1994 - 1999	Physician, Harvard Vanguard Medical Associates, Boston, MA
1987 - 1996	Captain, United States Army Reserve, Medical Corps

Honors:

2019	Fellow, American College of Endocrinology
2019	Preaw Hanseree Memorial Lecture, University of Wisconsin-Madison
2017	Lesbian, Gay, Bisexual and Transgender Health Award, Massachusetts Medical Society
2012	Outstanding Service Award, Association of Program Directors in Endocrinology and Metabolism
2007	Fellow, American College of Physicians
2004	Boston University School of Medicine Outstanding Student Mentor Award
2001	Abbott Thyroid Research Advisory Council Award
1996	Knoll Thyroid Research Clinical Fellowship Award, Endocrine Society
1995	Trainee Investigator Award for Excellence in Scientific Research, American Federation for Clinical Research (AFCR)
1994	Trainee Investigator Award for Excellence in Scientific Research, AFCR
1990	The University of Wisconsin Medical Alumni Association Award
1988-1990	Senior Class President, University of Wisconsin, School of Medicine

Licensure and Certification

1997	Board Certification in Endocrinology, Diabetes and Metabolism, American Board of Internal Medicine, recertified 2007, 2017
1994	Board Certification in Internal Medicine, American Board of Internal Medicine, recertified 2007
1993	Massachusetts License Registration #77459, inactive
1990	New York License Registration #187263-1

Departmental and University Committees

Boston Medical Center

2016-2018	Physician Satisfaction Task Force, Department of Medicine
2016-2018	Transgender Patient Task Force
2006-2017	Pharmacy and Therapeutics Committee, Health Net Plan

Boston University School of Medicine

2009-2018	Admissions Committee
2005	Review Committee, Department of Medicine Pilot Project Grants
2000	Residency and Fellowship Core Curriculum Committee,
2000-2018	Internship Selection Committee, Residency Program in Medicine

Boston University Goldman School of Dental Medicine

2003-2018	Course Directors Committee, Goldman School of Dental Medicine

Teaching Experience and Responsibilities

Icahn School of Medicine at Mount Sinai

2019-present Lecturer in Endocrinology, Second-year Pathophysiology Course

Tufts University School of Medicine

2016-2018 Lecturer in Endocrinology, Second-year Pathophysiology Course

Boston University School of Medicine

2003-2018 Course Director, Disease and Therapy - Endocrinology Section

1999-2018 Regular lectures to medical students, residents, and fellows on thyroid disease, diabetes insipidus, and transgender medicine

Boston University Goldman School of Dental Medicine

2002-2018 Course Director, General Medicine and Dental Correlations

2002-2018 Course Director, Medical Concerns in the Dental Patient

Major Administrative Responsibilities

2018-present	Executive Director, Center for Transgender Medicine and Surgery, Mount Sinai Health System, New York City, NY
2016-2018	Medical Director, Center for Transgender Medicine and Surgery, Boston Medical Center, Boston, MA
2007-2018	Director, Medical Education, Endocrinology Section, Boston University School of Medicine, Boston, MA
2007-2018	Program Director, Endocrinology Fellowship Training, Boston University Medical Center, Boston, MA
1999-2003	Director, Thyroid Clinic, Boston Medical Center, Boston, MA

Other Professional Activities

Professional Societies: Memberships

2016-present	United States Professional Association for Transgender Health (USPATH)
2014-present	World Professional Association for Transgender Health (WPATH)
2007-present	Association of Program Directors in Endocrinology and Metabolism (APDEM)
2007-present	Association of Specialty Professors (ASP), Alliance of Academic Internal Medicine (AAIM)
1999-present	American Association of Clinical Endocrinologists
1998-2018	American Thyroid Association
1995-present	Endocrine Society
1994-present	American College of Physicians
1994-1996	American Federation for Medical Research
1993-2018	Massachusetts Medical Society

Professional Societies: Offices Held and Committee Assignments

International

International Olympic Committee (IOC)

2017-present	Drafting Group Member, Medical Guidelines, International Olympic Committee

World Professional Association for Transgender Health (WPATH)

2016-present	Writing Committee Member, Standards of Care for the Health of Transsexual, Transgender, and Gender Nonconforming People
2016-2018	Co-Chair, Scientific Committee, International Meeting, Buenos Aires - 2018
2015-2016	Chair, Scientific Committee, International Meeting, Amsterdam - 2016
2015-present	Task Force Member, Global Education Initiative
2015-present	Media Liaison

TransNet – International Consortium for Transgender Medicine and Health Research

2014-present	Secretary and Co-Chair, Steering Committee

National

United States Professional Association for Transgender Health (USPATH)
2018-2019 President

Alliance of Academic Internal Medicine
2016-2019 Chair, Compliance Committee
2016-2017 Committee member, Compensation
2015-2016 President, Association of Specialty Professors (ASP)
2014-2017 Council member
2014-2019 Task Force member, Program Planning
2014-2019 Work Group member, Survey Center
2013-2015 Chair, Program Planning Committee, ASP
2012-2017 Council member, ASP
2012-2013 Chair, Membership Services Committee, ASP
2010-2015 Chair, Program Directors Site Visit Training Seminar, ASP
2007-2013 Committee member, Membership Services, ASP

American College of Physicians
2016-2018 Council of Subspecialty Societies member

Endocrine Society
2017-present Advisory Board member, Transgender/Disorders of Sex Development
2017-present Committee member, Clinical Endocrine Education
2014-present Media Liaison for Transgender Medicine
2014-2017 Task Force member, Endocrine Treatment of Transgender Persons Clinical Practice Guideline

American Board of Internal Medicine
2013-2018 Task Force member, Endocrinology Procedures
2013 Task Force member, ASP/AAIM/ACGME/ABIM Joint Next Accreditation System Internal Medicine Subspecialty Milestones

Association of Program Directors in Endocrinology and Metabolism
2017-2018 Secretary-Treasurer
2012-2018 Task Force member, Next Accreditation System Endocrinology Milestones
2011-2012 Task Force member, Procedures Accreditation
2010-2012 Council member
2009-2016 Chair, Site Visit/Curriculum Web-Toolbox Committee

American Thyroid Association
2006-2009 Publications Committee member
2004 Program Committee member

Editorships and Editorial Boards

2018-present Associate Editor, *Transgender Health*
2017-present Editorial Advisory Board, *Endocrine News*
2016-present Transgender Section Co-Editor, *UpToDate*

2015-present	Editorial Board, *Transgender Health*
2015-present	Editorial Board, *International Journal of Transgender Health*
2013-2018	Associate Editor, *Journal of Clinical & Translational Endocrinology*
2007-present	Editorial Board, *Endocrine Practice*

External Medical Advising and Consulting

International

2016-present	International transgender athlete guidelines, Medical and Scientific Commission, International Olympic Committee

National

2017	Transgender medical and surgical treatment, National Collegiate Athletic Association,
2017	Safety for transgender medical treatment, Food and Drug Administration, United States
2015-present	Transgender workforce and military readiness, Department of Defense, United States
2014	Transgender prison population health, Federal Bureau of Prisons, United States

Regional

2011-2018	Transgender prison population health, Massachusetts Department of Correction

Past Other Support

2018-2020	Keith Haring Foundation, **PI: Joshua D. Safer**, Pilot Program to Develop Clinical Program in Transgender Medicine for Children and Adolescents
2015-2016	R13 HD084267, **Multi-PI: Joshua D. Safer**, TransNet: Developing a Research Agenda in Transgender Health and Medicine
2014-2015	Boston Foundation, Equality Fund, **PI: Joshua D. Safer**, Pilot Program to Educate Physicians in Transgender Medicine
2013-2014	Evans Foundation, **PI: Joshua D. Safer**, A Pilot Curriculum in Transgender Medicine
2001-2003	Thyroid Research Advisory Council, **PI: Joshua D. Safer**, Thyroid Hormone Action on Skin
2001-2002	Evans Foundation, **PI: Joshua D. Safer**, Thyroid Hormone Action on Skin
1996-2001	K08 DK02423, **PI: Joshua D. Safer**, Characterization of Central Resistance to Thyroid Hormone

Conferences Organized

International Conferences

World Professional Association for Transgender Health

November, 2020 Bi-annual meeting, Planning Committee, Hong Kong (scheduled)

November, 2018 Bi-annual meeting, Scientific Co-Chair, Buenos Aires, Argentina

June, 2016 Bi-annual meeting, Scientific Co-Chair, Amsterdam, Netherlands

November, 2015 Global Education Initiative, inaugural conference, Chicago, IL

TransNet – International Consortium for Transgender Health and Medicine Research

May, 2016 International meeting to set transgender medicine research priorities, Amsterdam, Netherlands

May, 2015 NIH conference to set transgender medicine research priorities, Bethesda, MD

June, 2014 Inaugural meeting, Chicago, IL

National Conferences

May, 2020 Topics in Surgery Course for Gender Affirmation Procedures, Mount Sinai Hospital and WPATH, New York City, NY (scheduled)

February, 2019 Live Surgery Course for Gender Affirmation Procedures, Mount Sinai Hospital and WPATH, New York City, NY

April, 2018 Live Surgery Course for Gender Affirmation Procedures, Mount Sinai Hospital and WPATH, New York City, NY

January, 2017 United States Professional Association for Transgender Health (USPATH) bi-annual meeting, Los Angeles, CA

November, 2015 NIH/Alliance for Academic Internal Medicine - Physician Researcher Workforce Taskforce Meeting, Washington, DC

October, 2015 National Internal Medicine Subspecialty Summit, Atlanta, GA

June, 2013 Special Symposium: "Transgender Medicine – What Every Physician Should Know" Annual Meeting of the Endocrine Society, San Francisco, CA

April, 2011 2011 ASP Accreditation Seminar "Meeting the ACGME and RRC-IM Standards for Successful Fellowship Programs" Arlington, VA

Alliance for Academic Internal Medicine

April, 2015 2015 ASP Accreditation Seminar "Moving Your Fellowship Program Forward" Spring Meeting, Houston, TX

April, 2014 2014 ASP Accreditation Seminar "NAS for Medical Subspecialties Is Almost Here" Spring Meeting, Nashville, TN

May, 2013 2013 ASP Accreditation Seminar "A Changing Landscape in Subspecialty Fellowship Education" Spring Meeting, Lake Buena Vista, FL

April, 2012 2012 ASP Accreditation Seminar "Meeting ACGME and RRC-IM Standards for Successful Fellowship Programs" Spring Meeting, Atlanta, GA

Invited Lectures and Presentations

International

January, 2020 "Transgender Medicine", World Professional Association for Transgender Health Global Education Initiative, Hanoi, Vietnam

September, 2019 "Transgender Women" International Association of Athletics Federations (IAAF), Lausanne, Switzerland

November, 2018 "Transgender Medicine", World Professional Association for Transgender Health Annual Meeting, Buenos Aires, Argentina

October, 2018 "Transgender Medicine", Canadian Endocrine Diabetes Meeting, Halifax, NS, Canada

June, 2018 "21^{s}-Century Strategies: Transgender Hormone Care" CMIN Summit 2018, Porto, Portugal

February, 2017 "A 21st-Century Framework to for Transgender Medical Care" Sheba Hospital, Tel Aviv, Israel

October, 2016 "A 21st-Century Approach to Hormone Treatment of Transgender Individuals" EndoBridge, Antalya, Turkey

May, 2016 "Transgender Women" International Olympic Committee Headquarters, Lausanne, Switzerland

October, 2015 "Workshop on Guidelines for Transgender Health Care" Canadian Professional Association for Transgender Health, Halifax, NS

March, 2015 "Endocrinology - Hormone Induced Changes" Transgender Health Care in Europe, European Professional Association for Transgender Health, Ghent, Belgium

June, 2014 "What to Know to Feel Safe Providing Hormone Therapy for Transgender Patients" International Congress of Endocrinology, Chicago, IL

September, 2011 "Transgender Therapy – The Endocrine Society Guidelines" World Professional Association for Transgender Health, Atlanta, GA

February, 2007 "Treating skin disease by manipulating thyroid hormone action" Grand Rounds, Meier Hospital, Kfar Saba, Israel

March, 2004 "New Directions in Thyroid Hormone Action: Skin and Hair" Grand Rounds, Meier Hospital, Kfar Saba, Israel

National

June, 2020 "Transgender Medicine", Inova Fairfax Medicine Grand Rounds, Fairfax, VA (scheduled)

June, 2020 "Transgender Medicine", Mount Sinai Hospital Internal Medicine CME, New York, NY (scheduled)

May, 2020 "Transgender Medicine", Mount Sinai/World Professional Association for Transgender Health Special Topics in Surgical Care CME, New York, NY (scheduled)

March, 2020 "Transgender Medicine", Science Hub lecture, Endocrine Society Annual Meeting, San Francisco, CA (scheduled)

December, 2019 "Transgender Medicine", Vanderbilt University Surgery Grand Rounds, Nashville, TN

November, 2019 "Transgender Medicine", Medical College of Wisconsin CME, Milwaukee, WI

September, 2019 "Transgender Medicine", Beth Israel Deaconess Medicine Grand Rounds, Boston, MA

September, 2019 "Transgender Medicine", United States Professional Association for Transgender Health Annual Meeting, Washington, DC

June, 2019 "Transgender Medicine", Mount Sinai Hospital Internal Medicine CME, New York, NY

April, 2019 "A 21st-Century Strategy for Hormone Treatment of Transgender Individuals" National Transgender Health Summit, Oakland, CA

March, 2019 "Transgender Medicine" National Eating Disorders Meeting, New York, NY

January, 2019 "Transgender Medicine" Yale School of Medicine Obstetrics and Gynecology Grand Rounds, New Haven, CT

January, 2019 "Transgender Medicine" Yale School of Medicine Endocrinology Grand Rounds, New Haven, CT

January, 2019 "Transgender Medicine" Drexel School of Medicine Medicine Grand Rounds, Philadelphia, PA

September, 2018 "Current Guidelines and Strategy for Hormone Treatment of Transgender Individuals" Minnesota-Midwest Chapter - American Association of Clinical Endocrinologists Annual Meeting, Minneapolis, MN

July, 2018 "21st-Century Strategies for Transgender Hormone Care" Ohio River Valley Chapter - American Association of Clinical Endocrinologists Meeting, Indianapolis, IN

June, 2018 "21s-Century Strategies: Transgender Hormone Care" University of Connecticut School of Medicine, Hartford, CT

May, 2018 "A 21st-Century Strategy for Hormone Treatment of Transgender Individuals" American Association of Clinical Endocrinologists Annual Meeting, Boston, MA

March, 2018 "21st-Century Strategies for Transgender Hormone Care" New Jersey Chapter - American Association of Clinical Endocrinologists Meeting, Morristown, NJ

February, 2018 "A Strategy for the Medical Care of Transgender Individuals" Keynote Address for the International Society for Clinical Densitometry Annual Meeting, Boston, MA

November, 2017 "A 21st-Century Strategy for Hormone Treatment of Transgender Individuals" National Transgender Health Summit, Oakland, CA

September, 2017 "Transgender Therapy – The Endocrine Society Guidelines" Endocrine Society: Clinical Endocrinology Update, Chicago, IL

May, 2017 "Transgender Medicine – a 21st Century Strategy for Patient Care" University of Arizona College of Medicine, Tucson, AR

April, 2017 "Transgender Care Across the Age Continuum" Annual Meeting of the Endocrine Society, Orlando, FL

March, 2017 "A 21st-Century Approach to Hormone Treatment of Transgender Individuals" Brown University School of Medicine, Providence, RI

March, 2017 "What to Know: A 21st-Century Approach to Transgender Medical Care" United States Food and Drug Administration (FDA), Washington, DC

February, 2017 "A 21st-Century Approach to Transgender Medical Care" United States Professional Association for Transgender Health, Los Angeles, CA

February, 2017 "A 21st-Century Approach to Hormone Treatment of Transgender Individuals" Southern States American Association of Clinical Endocrinologists Annual Meeting, Memphis, TN

December, 2016 "Transgender Medical Care in the United States Armed Forces" Global Education Initiative, World Professional Association for Transgender Health, Arlington, VA

December, 2016 "Foundations in Hormone Treatment" Global Education Initiative, World Professional Association for Transgender Health, Arlington, VA

November, 2016 "Developing a Transgender/Gender-Identity Curriculum for Medical Students" Association of American Medical Colleges National Meeting, Seattle, WA

September, 2016 "A 21st-Century Approach to Hormone Treatment of Transgender Individuals" Endocrine Society: Clinical Endocrinology Update, Seattle, WA

August, 2016	"A 21st-Century Approach to Hormone Treatment of Transgender Individuals" Oregon Health and Science University Ashland Endocrine Conference, Ashland, OR
March, 2016	"State-of-the-Art: Use of Hormones in Transgender Individuals" Annual Meeting of the Endocrine Society, Boston, MA
October, 2015	"What Every Endocrinologist Should Know to Feel Safe Providing Hormone Therapy for Transgender Patients" University of Utah School of Medicine, Salt Lake City, UT
April, 2015	"What to Know –to Feel Safe Providing Hormone Therapy for Transgender Patients" Pritzker School of Medicine, University of Chicago, Chicago, IL
March, 2015	"What to Know –to Feel Safe with Hormone Therapy for Transgender Patients" Annual Transgender Health Symposium, Medical College of Wisconsin, Milwaukee, WI
May, 2014	"Transgendocrinology" Annual Meeting of the American Association of Clinical Endocrinologists, Las Vegas, NV
May, 2013	"Transgender Therapy – Hormone Action and Nuance" National Transgender Health Summit, Oakland, CA
April, 2013	"Transgender Therapy – What Every Provider Needs to Know" Empire Conference: Transgender Health and Wellness, Albany, NY
April, 2013	"Transgender Therapy – What Every Endocrinologist Needs to Know" University of Maryland School of Medicine, Baltimore, MD
November, 2012	"Transgender Therapy – What Every Endocrinologist Should Know" New York University School of Medicine, New York, NY
May, 2010	"Transgender Treatment: What Every Endocrinologist Needs to Know" Brown University School of Medicine, Providence, RI
November, 2009	"New Directions in Thyroid Hormone Action: Skin and Hair" Emory University School of Medicine, Atlanta, GA
November, 2009	"Primary Care Update in the Treatment of Thyroid Disorders" Emory University School of Medicine, Atlanta, GA
October, 2008	"Topical Iopanoic Acid Stimulates Epidermal Proliferation through Inhibition of the Type 3 Thyroid Hormone Deiodinase" Annual Meeting of the American Thyroid Association, Chicago, IL
February, 2005	"New Directions in Thyroid Hormone Action: Skin and Hair" Endocrinology Grand Rounds, University of Minnesota, Minneapolis, MN
February, 2005	"Thyroid Hormone Action on Skin and Hair: What We Thought We Knew" Dermatology Grand Rounds, University of Minnesota, Minneapolis, MN

December, 2004 "Transgender Therapy: The Role of the Endocrinologist" Endocrinology Grand Rounds, Brown Medical Center, Providence, RI

November, 2003 "New Directions in Thyroid Hormone Action: Skin and Hair" Endocrinology Grand Rounds, Dartmouth Medical Center, Hanover, NH

Regional

April, 2020 "Transgender Medicine", New York University Endocrinology CME, New York, NY (scheduled)

February, 2020 "Transgender Medicine", Englewood Hospital Medicine Grand Rounds, Englewood, NJ

February, 2020 "Transgender Medicine", Endocrinology Grand Rounds, Columbia College of Physicians and Surgeons, New York, NY

January, 2020 "Transgender Medicine", CEI, Lake Placid, NY

November, 2019 "Transgender Medicine", Weill Cornell Reproductive Endocrine Grand Rounds, New York, NY

November, 2019 "Transgender Medicine", Acacia Network Grand Rounds, New York, NY

October, 2019 "Transgender Medicine", American Association of Clinical Endocrinologists - New Jersey, annual meeting, Morristown, NJ

October, 2019 "Transgender Medicine", Community Health Network annual conference, New York, NY

October, 2019 "Transgender Medicine", Westchester Medical Center Medicine Grand Rounds, Valhalla, NY

September, 2019 "Transgender Medicine", Weill Cornell Reproductive Endocrine CME, New York, NY

September, 2019 "Transgender Competency for Medical Providers", Working Group on Gender, Columbia College of Physicians and Surgeons, New York, NY

April, 2019 "Transgender Medicine", Weill Cornell Urology Grand Rounds, New York, NY

June, 2018 "21^{s}-Century Strategies: Transgender Hormone Care" Medicine Grand Rounds, Staten Island University Hospital, Staten Island, NY

February, 2018 "Transgender Medicine – 21st Century Strategies for Patient Care" Medicine Rounds, Newton-Wellesley Hospital, Newton, MA

October, 2017 "Transgender Medicine – 21st Century Strategies for Patient Care" Medicine Rounds, Beth Israel-Milton Hospital, Milton, MA

September, 2017 "Transgender Medicine – 21st Century Strategies for Patient Care" Obstetrics-Gynecology Grand Rounds, Brigham and Women's Hospital, Boston, MA

June, 2017 "State-of-the-Art: Hormone Therapy for Transgender Patients" Reproductive Endocrinology Rounds, Massachusetts General Hospital, Boston, MA

May, 2017 "A 21st-Century Strategy for Medical Treatment of Transgender Individuals" Boston Medical Center and Boston University School of Medicine, Boston, MA

March, 2017 "A 21st-Century Strategy for Medical Treatment of Transgender Individuals" Tufts Medicine Grand Rounds, Boston, MA

January, 2017 "What to Know: A 21st-Century Approach to Transgender Medical Care" Internal Medicine Rounds, Brigham and Women's Hospital, Boston, MA

March, 2016 "State-of-the-Art: Hormone Therapy for Transgender Patients" Obstetrics-Gynecology Rounds, Brigham and Women's Hospital, Boston, MA

November, 2015 "What Every Endocrinologist Should Know to Feel Safe Providing Hormone Therapy for Transgender Patients" Endocrinology Rounds, Tufts Medical Center, Boston, MA

May, 2015 "What Every Endocrinologist Should Know to Feel Safe Providing Hormone Therapy for Transgender Patients" Endocrinology Rounds, Massachusetts General Hospital, Boston, MA

December, 2014 "What to Know to Feel Safe Providing Hormone Therapy for Transgender Patients" Endocrinology Rounds, Beth Israel Deaconess Medical Center, Boston, MA

November, 2013 "Transgender Therapy – What Every Physician Should Know" Medicine Grand Rounds, Boston Veterans Administration Hospital, Boston, MA

May, 2005 "Transgender Therapy: The Role of the Endocrinologist", Endocrinology Rounds, Tufts-New England Medical Center, Boston, MA

January, 2004 "New Directions in Thyroid Hormone Action: Skin and Hair", Endocrinology Rounds, Brigham and Women's Hospital, Boston, MA

October, 1999 "The Many Faces of Hypothyroidism", Medicine Grand Rounds, Bedford Veterans Administration Hospital, Bedford, MA

Institutional, Icahn School of Medicine at Mount Sinai, New York, NY

April, 2020 "21st-Century Strategies for Transgender Hormone Care", Colorectal Medicine CME (scheduled)

March, 2020 "Transgender Medicine", Frontiers in Science (scheduled)

October, 2019 "Transgender Medicine", East Harlem HOP rounds, New York, NY

October, 2019 "Transgender Medicine", Mount Sinai HIV rounds, New York, NY

August, 2019 "Transgender Medicine", Mount Sinai Endocrinology Fellows Conference, New York, NY

February, 2019 "Transgender Medicine", Mount Sinai Endocrinology Grand Rounds, New York, NY

February, 2019 "Transgender Medicine", Mount Sinai Ob-Gyn Grand Rounds, New York, NY

April, 2018 "21st-Century Strategies for Transgender Hormone Care", HIV Grand Rounds

Institutional, Boston University School of Medicine, Boston, MA

March, 2017 "State of the Art Hormone Therapy for Transgender Patients", Section of Infectious Disease

January, 2017 "What you need to know – to supervise care for our transgender patients at BMC", Section of Endocrinology

February, 2016 "State of the Art Hormone Therapy for Transgender Patients", Department of Medicine

November, 2015 "What the Family Medicine Physician Should Know to Feel Safe Providing Hormone Therapy for Transgender Patients", Department of Family Medicine

November, 2014 "What the Anesthesiologist Should Know to Feel Safe Providing Hormone Therapy for Transgender Patients", Department of Anesthesia

January, 2014 "Update on the Current Guidelines for Transgender Hormone Therapy", Section of Endocrinology

October, 2011 "Transgender Therapy – What Every Physician Should Know", Department of Medicine

February, 2011 "Current Guidelines for Transgender Hormone Therapy: What Every Endocrinologist Should Know", Section of Endocrinology

November, 2005 "Thyroiditis and Other Insults to Thyroid Function" Core Curriculum in Adult Primary Care Medicine

November, 2005 "Interpretation of Thyroid Function Tests Made Easy" Core Curriculum in Adult Primary Care Medicine

January, 2005 "Transgender Therapy: The Role of the Endocrinologist" Endocrinology Grand Rounds

December, 2004 "Update in Endocrinology: Thyroid" Medicine Grand Rounds

January, 2004 "New Directions in Thyroid Hormone Action: Skin and Hair" Medicine Grand Rounds

March, 2003 "Thyroid Hormone Action on Hair and Skin" Endocrinology Grand Rounds

November, 1999 "Central Resistance to Thyroid Hormone – From Bedside to Bench" Endocrinology Grand Rounds

Curriculum development with external dissemination

2014-present Web site for Association of Program Directors of Endocrinology and Metabolism (APDEM), which serves as ***the primary resource for endocrinology fellowship program directors throughout the United States and Canada***.

- Sample curricula
- Streaming lectures to support specific curricular needs to feel programmatic gaps at certain programs
- New assessment forms that map skills to milestones that conform to Next Accreditation System (NAS) standards of the Accreditation Council for Graduate Medical Education (ACGME)

2013-present Dissemination of Transgender Medicine Curriculum with local modification to institutions in the United States and Canada

Curriculum adopted

Johns Hopkins School of Nursing (sample video: http://vimeo.com/jhunursing/review/97477269/abbcf6d33a)
Ohio State University College of Medicine
University of British Columbia, Faculty of Medicine
University of Central Florida College of Medicine
Tufts University School of Medicine

Curriculum in development

Dartmouth School of Medicine
University of Vermont College of Medicine

Work in progress in preparation for sharing transgender curriculum

Albany Medical College
Emory School of Medicine
George Washington University Medical School
Hofstra School of Medicine
University of California – San Diego School of Medicine
University of Kentucky College of Medicine
University of Louisville School of Medicine
University of Michigan Medical School
University of Minnesota Medical School
University of Nebraska School of Medicine
University of Pennsylvania School of Medicine
Washington University School of Medicine

2013-2015 Co-author of the ***Medical Subspecialty Reporting Milestones used for evaluation of Internal Medicine subspecialty medicine fellowship programs throughout the Unites States*** by the Accreditation Council for Graduate Medical Education (ACGME).

https://www.acgme.org/acgmeweb/Portals/0/PDFs/Milestones/InternalMedicineSubspecialtyMilestones.pdf

2011-2014 Web site content expert for APDEM, which served as ***the primary resource for endocrinology fellowship Program directors throughout the United States and Canada***. Materials included sample curricula, streaming lectures to support specific curricular needs to feel programmatic gaps at certain programs, and guidance dealing with ACGME site-visits

Other curriculum development

2019-present Massive Open On-line Course (MOOC) curricular content. Transgender Medicine for General Medical Providers, Icahn School of Medicine at Mount Sinai (https://www.coursera.org/courses?query=transgender%20medicine%20for%20general%20medical%20providers&)

2016-2018 Curricular Content to teach transgender hormone therapy in the LGBT elective at Harvard Medical School

2016-2018 Curricular Content to teach transgender hormone therapy at Tufts University School of Medicine.

2011-2018 Fully revised curriculum for the Boston University Medical Center Fellowship Training Program in Endocrinology, Diabetes and Nutrition.

2010-2018 Curricula to teach transgender hormone therapy at Boston University School of Medicine.

2006-2014 Written examination in endocrinology to complement the multiple-choice examination for medical students — validation relative to success later in medical school is in progress.

Bibliography: (ORCID # 0000 0003 2497 8401)

Names of mentees are underlined throughout the bibliography section

** currently most influential papers are noted with double asterisks

Original, Peer-Reviewed Articles

1. **Safer JD**, Langlois MF, Cohen R, Monden T, John-Hope D, Madura J, Hollenberg AN, Wondisford FE. Isoform variable action among thyroid hormone receptor mutants provides insight into pituitary resistance to thyroid hormone. *Mol Endocrinol* 1997;11(1):16-26. PMID 8994184

2. Langlois MF, Zanger K, Monden T, **Safer JD**, Hollenberg AN, Wondisford FE. A unique role of the beta-2 thyroid hormone receptor isoform in negative regulation by thyroid hormone - mapping of a novel amino-terminal domain important for ligand-independent activation. *J Biol Chem* 1997;272(40):24927-24933. PMID 9312095

3. **Safer JD**, Cohen RN, Hollenberg AN, Wondisford, FE. Defective release of corepressor by hinge mutants of the thyroid hormone receptor found in patients with resistance to thyroid hormone. *J Biol Chem* 1998;273(46):30175-30182. PMID 9804773

4. **Safer JD**, O'Connor MG, Colan SD, Srinivasan S, Tollin SR, Wondisford FE. The TR-beta gene mutation R383H is associated with isolated central resistance to thyroid hormone. *J Clin Endocrinol Metab* 1999;84(9):3099-3109. PMID 10487671

5. **Safer JD**, Fraser LM, Ray S, Holick MF. Topically applied triiodothyronine stimulates epidermal proliferation, dermal thickening, and hair growth in mice and rats. *Thyroid* 2001;1(8):717-724. PMID 11525263

6. Tangpricha V, Chen BJ, Swan NC, Sweeney AT, de las Morenas A, **Safer JD**. Twenty-one gauge needles provide more cellular samples than twenty-five gauge needles in fine needle aspiration biopsy of the thyroid. *Thyroid* 2001;11(10):973-976. PMID 11716046

7. **Safer JD**, Crawford TM, Fraser LM, Hoa M, Ray S, Chen TC, Persons K, Holick MF. Thyroid hormone action on skin: diverging effects of topical versus intraperitoneal administration. *Thyroid* 2003;13(2):159-165. PMID 12699590

8. Santini F, Ceccarini G, Montanelli L, Rosellini V, Mammoli C, Macchia P, Gatti G, Pucci E, Marsili A, Chopra IJ, Chiovato L, Vitto P, **Safer JD**, Braverman LE, Martino E, Pinchera A. Role for inner ring deiodination preventing transcutaneous passage of thyroxine. *J Clin Endocrinol Metab* 2003;88(6):2825-2830. PMID 12788895

9. **Safer JD**, Crawford TM, Holick MF. A role for thyroid hormone in wound healing through keratin gene expression. *Endocrinology* 2004;145(5):2357-2361. PMID 14736740

10. **Safer JD**, Crawford TM, Holick MF. Topical thyroid hormone accelerates wound healing in mice. *Endocrinology* 2005;146(10):4425-4430. PMID 15976059

11. Saha AK, Persons K, **Safer JD**, Luo Z, Holick MF, Ruderman NB. AMPK regulation of the growth of cultured human keratinocytes. *Biochem Biophys Res Co* 2006;349(2):519-24. PMID 16949049

12. **Safer JD**, Ray S, Holick MF. A topical PTH/PTHrP receptor antagonist stimulates hair growth in mice. *Endocrinology* 2007;148(3):1167-1170. PMID 17170098

13. **Safer JD**, Persons K, Holick MF. A thyroid hormone deiodinase inhibitor can decrease cutaneous cell proliferation in vitro. *Thyroid* 2009;19(2):181-185. PMID 19191748

14. Ariza MA, Loken WM, Pearce EN, **Safer JD**. Male sex, African-American race/ethnicity, and T3 levels at diagnosis are predictors of weight gain following medication and radioactive iodine treatment for hyperthyroidism. *Endocr Pract* 2010;16(4):609-616. PMID 20350916

15. Abraham TM, de las Morenas A, Lee SL, **Safer JD**. In thyroid fine needle aspiration, use of bedside-prepared slides significantly increased diagnostic adequacy and specimen cellularity relative to solution-based samples. *Thyroid* 2011;21(3):237-242. PMID 21323589

16. Huang MP, Rodgers KA, O'Mara R, Mehta M, Abuzahra HS, Tannenbaum AD, Persons K, Holick MF, **Safer JD**. The thyroid hormone degrading Dio3 is the primary deiodinase active in murine epidermis. *Thyroid* 2011;21(11):1263-1268. PMID 21936673

17. Toraldo G, Bhasin S, Bakhit M, Guo W, Serra C, S, **Safer JD**, Bhawan J, Jasuja R. Topical androgen antagonism promotes cutaneous wound healing without systemic androgen deprivation by blocking beta-catenin nuclear translocation and cross-talk with TGF-beta signaling in keratinocytes. *Wound Repair Regen* 2012;20:61-73. PMID 22276587

18**. **Safer JD**, Pearce EN. A simple curriculum content change increased medical student comfort with transgender medicine. *Endocr Pract* 2013;19(4):633-637. PMID 23425656
- First ever demonstration of the effectiveness of an evidence-based approach to teaching transgender medicine to medical students

19. Thomas DD, **Safer JD**. A simple intervention raised resident-physician willingness to assist transgender patients seeking hormone therapy. *Endocr Pract* 2015;21(10):1134-42. PMID 26151424

20. Mundluru SN, **Safer JD**, Larson, AR. Unforeseen ethical challenges for isotretinoin treatment in transgender patients. *Int J of Womens Dermatol* 2016;2(2):46-48. PMID 28492004

21. Eriksson SES, **Safer JD**. Evidence-based curricular content improves student knowledge and changes attitudes towards transgender medicine. *Endocr Pract* 2016;22(7):837-841. PMID 27042742

22. Chan B, Skocylas R, **Safer JD**. Gaps in transgender medicine content identified among Canadian medical school curricula. *Transgender Health* 2016;1(1):142-150. PMID 29159305

23. Myers SC, **Safer JD**. Increased rates of smoking cessation observed among transgender women receiving hormone treatment. *Endocr Pract* 2017;23(1):32-36. PMID 27682351

24. Berli J, Knudson G, Fraser L, Tangpricha V, Ettner R, Ettner F, **Safer JD**, Graham j, Monstrey S, Schecter L. Gender confirmation surgery: What surgeons need to know when providing care for transgender individuals. *JAMA Surgery* 2017;152(4):394-400. PMID 28196182

25. Kailas M, Lu HMS, Rothman EF, **Safer JD**. Prevalence and types of gender-affirming surgery among a sample of transgender endocrinology patients prior to state expansion of insurance coverage. *Endocr Pract* 2017;23(7):780-786. PMID 28448757

26. Liang JJ, Gardner IH, Walker JA, **Safer JD**. Observed deficiencies in medical student knowledge of transgender and intersex health. *Endocr Pract* 2017;23(8):897-906. PMID 28534684

27. Park JA, **Safer JD**. Clinical exposure to transgender medicine improves students' preparedness above levels seen with didactic teaching alone: A key addition to the Boston University model for teaching transgender health care. *Transgender Health* 2018;3(1),10-16. PMID 29344576

28. Liang JJ, Jolly D, Chan KJ, **Safer JD**. Testosterone levels achieved by medically treated transgender women in a United States endocrinology clinic cohort. *Endocr Pract* 2018; 24(2):135-142. PMID 29144822

29. Chan KJ, Jolly D, Liang JJ, Weinand JD, **Safer JD**. Estrogen levels do not rise with testosterone treatment for transgender men. *Endocr Pract* 2018; 24(4):329-333. PMID 29561193

30. Chan KJ, Liang JJ, Jolly D, Weinand JD, **Safer JD**. Exogenous testosterone does not induce or exacerbate the metabolic features associated with PCOS among transgender men. *Endocr Pract* 2018; 24(6):565-572. PMID 29624102

31. Bisson JR, Chan KJ, **Safer JD**. Prolactin levels do not rise among transgender women treated with estradiol and spironolactone. *Endocr Pract* 2018; 24(7):646-651. PMID 29708436

32. Getahun D, Nash R, Flanders D, Baird TC, Becerra-Culqui TA, Cromwell L, Hunkler E, Lash TL, Millman A, Quinn VP, Robinson B, Roblin D, Silverberg MJ, **Safer J**, Slovis J, Tangpricha V, Goodman M. Cross-sex hormones and acute cardiovascular events in transgender persons: A cohort study. *Ann Intern Med* 2018; 169(4):205-213. PMID 29987313

33. Martinson TG, Ramachandran S, Lindner R, Reisman T, **Safer JD**. High body-mass index is a significant barrier to gender confirmation surgery for transgender and gender-nonbinary individuals. *Endocr Pract* 2020; 26(1):6-15. PMID 31461357

34. Goldstein Z, Martinson TG, Ramachandran S, Lindner R, **Safer JD**. Improved rates of cervical cancer screening among transmasculine patients through self-collected swabs for high-risk human papillomavirus DNA testing. *Transgender Health* 2020; 5(1):10-17. PMID

35. Lichtenstein M, Stein L, Connolly E, Goldstein ZG, Martinson TG, Tiersten L, Shin SJ, Pang JH, **Safer JD**. The Mount Sinai patient-centered preoperative criteria meant to optimize outcomes are less of a barrier to care than WPATH SOC 7 criteria before transgender-specific surgery. *Transgender Health* 2020; In Press. PMID

Case Reports, Reviews, Chapters:

Editorials and Critical Reviews:

36. **Safer JD**, Colan SD, Fraser LM, Wondisford FE. A pituitary tumor in a patient with thyroid hormone resistance: A diagnostic dilemma. *Thyroid* 2001;11(3):281-291. PMID 11327621

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Mass Audience Programming:

"Transgender Health AMA" Reddit. July 24, 2017. Expert responses to questions about transgender medicine.
https://www.reddit.com/r/science/comments/6p7uhb/transgender_health_ama_series_im_joshua_safer/
over 150,000 views, over 4200 comments

"Gender Revolution with Katie Couric" National Geographic Channel. Couric, Katie. February 6, 2017.
Extended interview with Katie Couric threaded into a 2-hour television special. Trailer:
https://www.youtube.com/watch?v=y93MsRaC6Zw
broadcast in 143 countries

"Is gender identity biologically hard-wired?" Judd, Jackie. PBS NewsHour. May 13, 2015.
Extended interview for Jackie Judd http://www.pbs.org/newshour/bb/biology-gender-identity-children/
estimated just over 1,000,000 viewers per Nielsen

Innovation	**Significance/impact**
Development and leadership of the Transgender Medicine Clinical Center, Mount Sinai Health System and Icahn School of Medicine at Mount Sinai	• The Center for Transgender Medicine and Surgery at Mount Sinai is the first comprehensive center for transgender medical care in New York and the most comprehensive program in the United States • The Center is one of only several such centers in North America that are housed in academic teaching hospitals where care can be integrated • The Center is a model for such care delivery in North America.
Development and leadership of the Transgender Medicine Clinical Center at Boston Medical Center	• The Center for Transgender Medicine and Surgery at BMC is the first comprehensive center for transgender medical care in New England • The Center is one of only several such centers in North America that are housed in academic teaching hospitals where care can be integrated • The Center is a model for such care delivery in North America.
Development and dissemination of the seminal reviews that are most widely cited in the lay press that explain the concept that gender identity is a biological phenomenon (see bibliography section above, e.g. PMID: 25667367).	• The concept that gender identity is a biological phenomenon has been a key component of the recent culture change in favor of mainstream medical care for transgender individuals (see media section above)
Development and dissemination of new and influential curricular content to teach the biology of gender identity in conventional medical education (see curriculum section above)	The teaching of evidence-based approaches to transgender medical care to: • Medical students (see bibliography section above, e.g. PMID 23425656 and PMID 27042742) • Physician trainees (see bibliography section above, e.g. PMID 26151424) • Practicing physicians (see invited lectures section above) serves as a crucial component to the gained credence given to care for transgender individuals in conventional medical settings.
Development and dissemination of seminal reviews supporting the safety of transgender hormone treatment regimens (see invited lectures section above)	• Once mainstream medical providers learn of the biology underlying gender identity, their biggest concern is the relative safety of the medical interventions relative to the benefit. • The development and dissemination of the seminal reviews and lectures supporting the safety of current treatment regimens serves as a further crucial component to the culture change among conventional medical providers in favor of routine medical care for transgender individuals