Branding Asklepios and the Traditional and Variant Serpent Symbol Display Among Health Professional Schools in the United States, Puerto Rico, and Canada: A Cross-Sectional Survey

Claus Hamann¹*, MD, MS; MaryKate Martelon²*, MPH

¹Eastern Maine Healthcare Systems, Beacon Health, Brewer, ME, United States
²Massachusetts Department of Public Health, Boston, MA, United States
*all authors contributed equally

Corresponding Author:
Claus Hamann, MD, MS
Eastern Maine Healthcare Systems
Beacon Health
797 Wilson St.
Brewer, ME, 04412
United States
Phone: 1 617 538 5142
Fax: 1 207 989 1096
Email: chamann@emhs.org

Abstract

Background: History supports the staff and single serpent, the asklepian, as the symbol of healing and medicine, yet its confusion with the caduceus (a winged staff with two snakes wrapped around it) persists. No population-based information on serpent symbol use exists.

Objective: To determine the prevalence of asklepian and caduceus display among Internet images of medical and health professional schools’ emblems, and to compare asklepian and caduceus display between medical and health professional schools, examining the effects of school longevity and geographic location on symbol display.

Methods: This cross-sectional survey examined Internet websites and Google Images associated with medical and other health professional schools in the United States, Puerto Rico, and Canada from 2013 to 2015. The primary outcome was display of a traditional or variant asklepian or caduceus among current and past emblems in Google Images. Odds ratios (ORs) and 95% confidence intervals for the comparison of medical versus other health professional schools were calculated by logistic regression. Differences among schools’ longevity were assessed with Student’s t-tests and linear regression.

Results: Among images of current and past emblems of 482 schools—159 medical schools and 323 health professional schools—107 (22.2%) emblems displayed only the traditional, and 205 (42.5%) any, asklepian. Adjusting for geographic region and longevity, medical schools were 59% less likely than health professional schools to display the traditional asklepian (OR 0.41, 95% CI 0.24-0.71, P=.001), and were 7.7 times more likely than health professional schools to display the traditional caduceus. Medical schools were 8% less likely than health professional schools to display any asklepian (OR 0.92, 95% CI 0.62-1.38, P=.70), and were 3.3 times more likely than health professional schools to display any caduceus.

Conclusions: Schools’ preference of the asklepian over the caduceus confirmed historical origins. Less asklepian and more caduceus display by medical schools suggests an educational opportunity for the medical profession to define for itself and the public the correct symbol of an interdisciplinary mission of healing.

(JMIR Medical Education 2016;2(1):e6) doi: 10.2196/mededu.5515

KEYWORDS
caduceus; emblems; insign; insignia; history of medicine; history; humanities; Asklepios; Asclepius; medical symbol
Introduction

For more than two millennia, the single serpent of Epidaurus and staff of Asclepios—a combination named the asklepian [1]—have symbolized healing and medicine in the Greco-Roman tradition (see Figure 1, a-c, for photos of these symbols [2]).

For two centuries, the Sumerian-derived caduceus of Hermes (ie, Mercury) [3], the messenger god (a winged staff with two snakes wrapped around it, see Figure 1, d), has been displayed by many health-related organizations as a quasi-symbol of health care since its use by a nineteenth-century medical publisher [1]. This symbol substitution was accelerated by adoption of the caduceus as an insignia for noncombatant officers of the US Army Medical Corps in 1902 [4] despite the Corps’ use of the asklepian since 1818 [5]. Le caducé has been used to describe the single serpent entwining fascicles [6] and the asklepian has been misnamed “the medical caduceus” [1,7]. The US error, explained in 1917 [5], has been discussed in at least 30 articles for a century [8]. Confusion as to the correct symbol for healing, medicine, and health care persists in both professional and popular usage.

The distinctive meanings of these mythological symbols are well described. The traditional, pruned branch-like staff of Asklepios and its single entwined serpent each represent healing and restoration through regeneration: new twigs growing from a pruned branch and the snake shedding its former skin [9]. Hippocrates was known as an Asclepiad [10] and graduands invoke Asklepios in the traditional Hippocratic oath [11]. The caduceus of Hermes, a smooth, winged, herald’s wand with two entwined serpents, is associated with communication, wisdom, peace, commerce, alchemy, thievery, and tangentially with healing [6].

Medical and kindred health professional schools—where initial exposure to these symbols occurs—are among the “professional medical organizations...more likely to use the staff of Aesculapius” [6], though selection criteria, analytic method, and calculations were not described by the author. A detailed pictorial history of the asklepian [12] and a survey [13] provided only qualitative support for preference of the asklepian over the caduceus by medical and health organizations.

To the authors’ knowledge, only one other study has examined the display of these symbols. Among the 10 leading medical colleges in India, 1 displayed the asklepian, 6 used the caduceus, and 3 used neither [14]. To inform current and future use of these symbols by medical and health professional schools, other health care organizations, and the public, this study asks the following questions: Do schools display the asklepian more than the caduceus? Do medical schools display either symbol more than do health professional schools? Do school longevity or geographic location influence display of either symbol?

Figure 1. Asklepian from a Roman Aesculapian temple and caduceus from a Florentine sculpture. (a) Tiber Island, Rome 2004 [2]. The arrow indicates the travertine ship's prow, which is seen in (b,c); (b,c) Asklepian carved into the travertine ship's prow from the 1st century BCE at the site of an Aesculapian temple [2], 300 m from the current-day Ospedale Fatebenefratelli (photo by author, 2008); (d) Bronze by Gianbologna, Mercurio (Mercury, the Roman name for Hermes), 1580, Museo Nazionale del Bargello, Florence, Italy (excerpt of photo by author, 2013).
Methods

From November 2013 to January 2015, we compared Internet displays of asklepians and caducei among emblems of all accredited American, Puerto Rican, and Canadian allopathic medical schools [15] to those of all accredited schools of osteopathic, podiatric, and veterinary medicine, and of dentistry, optometry, and pharmacy [16-25]. The primary outcome was the display of a traditional, or any variant of a traditional, asklepian or caduceus among Google Images [26] of current or past emblems associated with a school, its departments, or organizations. We also examined the display of symbols in each school’s current emblem on its home page.

The primary author (CH) searched Google Images, which ranks images according to keywords, richness of text descriptions, and website links for each image [26]. Images were searched up to the “Show more results” line at the bottom of the webpage. This strategy included, on average, the first 398 images (SD 3.3) based on a 1% random sample. Each home page of all medical and health professional schools in the respective directories was also accessed via the link provided in the directory or via the school’s name entered in the Google Web search field. To obtain images (ie, screenshots) of emblems, each name was entered in the Google Images search field. Sites displaying either symbol were again accessed between November 2014 and January 2015 to verify active display; Google Image search [27] was conducted for inactive Web addresses. For all schools, the same emblems displayed on home pages were also found in searches for images.

Examples of traditional and variant asklepians and caducei are shown in Figure 2, a-k [28-38]. We defined the traditional asklepian as the display of the branch-like staff and a single serpent (see Figure 2, a), regardless of serpent chirality, number of coils, or ornamentation. Dentistry’s emblem is the dental cautery—equivalent of the asklepian staff [39]—with entwined single serpent. Additional features of dentistry’s emblem are the berries and leaves that represent temporary and permanent teeth, respectively, and the Greek letters omicron, odont (ie, tooth), and delta (ie, dentistry) (see Figure 2, d). For pharmacy, the asklepian equivalent was defined as a display of the bowl of Hygieia, a daughter of Asklepios [40], with an entwined single serpent [41] (see Figure 2, e). We defined the traditional caduceus as two mirror-image serpents entwining a smooth, winged wand (see Figure 2, f), regardless of the number of coils or ornamentation. In addition to the traditional asklepian and caduceus, we designated two asklepian variants (see Figure 2, b, c, and i) and one caduceus variant (see Figure 2, g and j), according to staff and wand features described in Multimedia Appendix 1. Author agreement on traditional and variant symbols was reliable at a kappa [42] of .91.

We defined each medical and health professional school’s major US census region [43] as follows: Puerto Rican schools were grouped into the South region; British Columbia and Alberta were grouped into the West region; Saskatchewan and Manitoba were grouped into the Midwest region; and the remaining Canadian provinces were grouped into the Northeast region. School longevity was defined as the founding year subtracted from 2014. Each school’s founding year was identified from its home page under the About Us/History tab or by entering the school’s name and the words “founded in” in the Google Web search field.

Current and past emblems from images and current emblems from home pages were analyzed independently. Odds ratios (ORs) (95% CI) for asklepian versus caduceus display and for interaction effects of geographic region and longevity on the relationship between school type and symbol display were calculated by logistic regression. School longevity was normally distributed and calculated as mean (SD). Differences among schools’ longevity were assessed with Student’s t-tests and linear regression. Statistical significance was asserted at <.05; all
statistical tests were two-tailed. Analyses were performed with Stata version 13.1 (StataCorp LP, College Station, TX). The institutional review board of Mercy Medical Center, Springfield, MA, waived review of this study.

Results

Among images of current and past emblems of 482 schools—159 medical schools (33.0%) and 323 health professional schools (67.0%)—107 (22.2%) displayed traditional asklepians and 205 (42.5%) displayed any asklepian (see Table 1). A total of 18 of the 482 schools (3.7%) displayed the traditional caduceus; 25 (5.2%) displayed any caduceus. A total of 249 schools (51.7%) displayed neither symbol.

Adjusting for geographic region and longevity, medical schools were 59% less likely than health professional schools to display traditional asklepians (OR 0.41, 95% CI 0.24-0.71, P=.001) (see Table 2, Current and past emblems in Google Images), yet were 7.7 times more likely than health professional schools to display the traditional caduceus (95% CI 1.43-7.75, P=.005). In a secondary analysis of home pages, 36 current emblems of all 482 schools (7.5%) displayed traditional asklepians, and 77 (16.0%) displayed any asklepian (see Table 3). A total of 7 of the 482 schools (1.5%) displayed the traditional caduceus and 8 (1.7%) displayed any caduceus.

Adjusting for geographic region and longevity, medical schools were 62% less likely than health professional schools to display traditional asklepians in current home page emblems—a statistically nonsignificant result (adjusted OR 0.38, 95% CI 0.14-1.02, P=.06; see Table 2). The higher odds of caduceus display by medical schools were also not significant.

For all schools in the United States or Puerto Rico compared to Canada, there were no significant differences in the display of asklepian versus caduceus (data not shown). Multimedia Appendices 2 and 3 contain the hyperlinked emblems of all schools displaying the asklepian, caduceus, and variants.
Table 1. Display of asklepians and caducei among current and past emblems in Google Images for US and Canadian medical and other health professional schools in 2014.

| Schools                      | Longevity<sup>a</sup>, mean (SD, range) | Traditional asklepians, n (%) | Traditional or variant asklepians, n (%) | Traditional caduceus, n (%) | Traditional or variant caduceus, n (%) | Neither/both, n (%) |
|------------------------------|-----------------------------------------|------------------------------|-----------------------------------------|----------------------------|----------------------------------------|---------------------|
|                              |                                         |                              |                                         |                            |                                        |                     |
| All schools (n=482)          | 75.8 (58.5, 1-249)                      | 107 (22.2)                   | 205 (42.5)                              | 18 (3.7)                   | 25 (5.2)                               | 252 (52.3)          |
| Medical schools              |                                         |                              |                                         |                            |                                        |                     |
| All (n=159)                  | 98.5 (61.3, 1-249)                      | 21 (13.2)                    | 65 (40.9)                               | 14 (8.8)                   | 16 (10.1)                              | 78 (49.1)<sup>b</sup> |
| US (n=137)                   | 97.7 (62.0, 1-249)                      | 18 (12.8)                    | 54 (38.3)                               | 14 (9.9)                   | 16 (11.3)                              | 71 (50.4)           |
| Canada (n=18)                | 104.5 (58.1, 9-185)                     | 3 (17)                       | 11 (61)                                 | 0 (0)                      | 0 (0)                                  | 7 (39)              |
| Medical schools: region      |                                         |                              |                                         |                            |                                        |                     |
| Northeast (n=44)             | 119.9 (72.8, 1-249)                     | 6 (14)                       | 20 (45)                                 | 3 (7)                      | 3 (7)                                  | 21 (48)             |
| Midwest (n=33)               | 97.9 (53.2, 1-178)                      | 4 (12)                       | 14 (42)                                 | 2 (6)                      | 2 (6)                                  | 17 (52)             |
| South (n=56)                 | 87.9 (58.8, 2-207)                      | 8 (14)                       | 22 (39)                                 | 7 (13)                     | 7 (13)                                 | 27 (48)             |
| West (n=26)                  | 86.0 (47.0, 6-195)                      | 3 (12)                       | 9 (35)                                  | 2 (8)                      | 4 (15)                                 | 13 (50)             |
| Other health professional schools: all types | | | | | | |
| All (n=323)                  | 65.8 (53.5, 1-193)                      | 86 (26.6)                    | 140 (43.3)                              | 4 (1.2)                    | 9 (2.8)                                | 174 (53.9)<sup>c</sup> |
| US (n=287), PR (n=3)        | 65.1 (53.8, 1-193)                      | 81 (27.9)                    | 130 (44.8)                              | 3 (1.0)                    | 7 (2.4)                                | 153 (52.8)          |
| Canada (n=33)                | 71.8 (44.0, 5-154)                      | 5 (15)                       | 10 (30)                                 | 1 (3)                      | 2 (6)                                  | 21 (64)             |
| Other health professional schools: region | | | | | | |
| Northeast (n=78)             | 74.3 (55.3, 1-193)                      | 10 (13)                      | 19 (24)                                 | 1 (1)                      | 1 (1)                                  | 58 (74)             |
| Midwest (n=75)               | 86.9 (49.3, 1-164)                      | 19 (25)                      | 33 (44)                                 | 1 (1)                      | 4 (5)                                  | 38 (51)             |
| South (n=106)                | 51.7 (46.7, 1-173)                      | 36 (34.0)                    | 54 (50.9)                               | 0 (0)                      | 1 (0.9)                                | 51 (48.1)           |
| West (n=64)                  | 53.9 (46.1, 1-144)                      | 21 (33)                      | 34 (53)                                 | 2 (3)                      | 3 (5)                                  | 27 (42)             |
| Other health professional schools: osteopathic medicine | | | | | | |
| All (n=40)                   | 32.3 (33.6, 1-122)                      | 16 (40)                      | 25 (63)                                 | 1 (3)                      | 1 (3)                                  | 14 (35)             |
| US (n=34)                    | 33.1 (36.2, 1-122)                      | 16 (47)                      | 25 (74)                                 | 0 (0)                      | 0 (0)                                  | 9 (26)              |
| Canada (n=6)                 | 27.5 (11.7, 11-33)                      | 0 (0)                        | 0 (0)                                   | 1 (17)                     | 1 (17)                                 | 5 (83)              |
| Other health professional schools: veterinary medicine | | | | | | |
| All (n=35)                   | 82.5 (45.5, 16-162)                     | 19 (54)                      | 28 (80)                                 | 0 (0)                      | 0 (0)                                  | 7 (20)              |
| US (n=30)                    | 82.8 (45.0, 16-162)                     | 17 (57)                      | 24 (80)                                 | 0 (0)                      | 0 (0)                                  | 6 (20)              |
| Canada (n=5)                 | 81.0 (58.3, 28-152)                     | 2 (40)                       | 4 (80)                                  | 0 (0)                      | 0 (0)                                  | 1 (20)              |
| Other health professional schools: podiatric medicine | | | | | | |
| All (n=10)                   | 60.9 (47.2, 5-119)                      | 2 (20)                       | 6 (60)                                  | 0 (0)                      | 0 (0)                                  | 4 (40)              |
| US (n=9)                     | 66.6 (47.1, 5-119)                      | 2 (22)                       | 6 (67)                                  | 0 (0)                      | 0 (0)                                  | 3 (33)              |
| Canada (n=1)                 | 10.0 (N/A<sup>f</sup>)                 | 0 (0)                        | 0 (0)                                   | 0 (0)                      | 0 (0)                                  | 1 (100)             |
| Other health professional schools: dentistry | | | | | | |
| All (n=74)                   | 80.7 (47.9, 1-174)                      | 18 (24)                      | 33 (45)                                 | 1 (1)                      | 2 (2)                                  | 39 (53)             |
| US (n=64), PR (n=1)         | 80.2 (49.7, 1-174)                      | 18 (28)                      | 30 (46)                                 | 1 (2)                      | 1 (2)                                  | 34 (52)             |
| Canada (n=9)                 | 83.8 (40.5, 43-139)                     | 0 (0)                        | 3 (33)                                  | 0 (0)                      | 1 (11)                                 | 5 (56)              |
| Schools | Longevity\(^a\), mean (SD, range) | Traditional asklepian, n (%) | Traditional or variant asklepian, n (%) | Traditional caduceus, n (%) | Traditional or variant caduceus, n (%) | Neither/both, n (%) |
|---|---|---|---|---|---|---|
| **Other health professional schools: pharmacy** | | | | | | |
| All (n=141) | 64.0 (55.5, 1-193) | 29 (20.6) | 44 (31.2) | 2 (1.4) | 4 (2.8) | 93 (66.0) |
| US (n=130), PR (n=1) | 62.2 (55.8, 1-193) | 26 (19.8) | 41 (31.3) | 2 (1.5) | 4 (3.1) | 86 (65.6) |
| Canada (n=10) | 88.6 (49.0, 5-154) | 3 (30) | 3 (30) | 0 (0) | 0 (0) | 7 (70) |
| **Other health professional schools: optometry** | | | | | | |
| All (n=23) | 65.4 (46.5, 1-168) | 2 (9) | 4 (17) | 0 (0) | 2 (9) | 17 (74) |
| US (n=20), PR (n=1) | 64.5 (47.7, 1-168) | 2 (10) | 4 (19) | 0 (0) | 2 (10) | 15 (71) |
| Canada (n=2) | 75.5 (51.1, 47-104) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 2 (100) |

\(^a\)Number of years since founding; \(t = -6.21; P < .001\).

\(^b\)Includes 3 medical schools (1.9%: the United States) displaying both symbols.

\(^c\)US: the United States.

\(^d\)PR: Puerto Rico.

\(^e\)Includes 2 health professional schools (0.6%: dentistry and pharmacy, both in the United States) displaying both symbols.

\(^f\)N/A: not applicable.

**Table 2.** Adjusted analysis of asklepian and caduceus in the emblems of US, Puerto Rican, and Canadian medical versus other health professional schools in 2014.

| Symbols | Traditional asklepian | Traditional or variant asklepian | Traditional caduceus | Traditional or variant caduceus |
|---|---|---|---|---|
| **Current and past emblems in Google Images** | | | | |
| Total, n | 107 | 205 | 18 | 25 |
| Adjusted OR\(^b\)\(^c\) | 0.41 | 0.92 | 7.70 | 3.32 |
| 95% CI | 0.24-0.71 | 0.62-1.38 | 2.50-23.80 | 1.43-7.75 |
| \(P\) | .001 | .70 | <.001 | .005 |
| **Current emblems on home pages** | | | | |
| Total, n | 36\(^d\) | 77\(^d\) | 7 | 8 |
| Adjusted OR\(^b\) | 0.38 | 1.08 | 2.75 | 1.92 |
| 95% CI | 0.14-1.02 | 0.62-1.89 | 0.61-12.50 | 0.47-7.80 |
| \(P\) | .06 | .79 | .19 | .36 |

\(^a\)OR: odds ratio.

\(^b\)Adjusted for school’s geographic region and longevity; health professional school was the reference variable. We found no significant interaction effects in the analysis of current and past emblems in Google Images.

\(^c\)Significant interaction effects in the analysis of current emblems on home pages were newer health professional schools displaying traditional asklepian more than older health professional schools (OR 1.020, 95% CI 1.002-1.040, \(P = .03\)).

\(^d\)Significant interaction effects in the analysis of current emblems on home pages were western medical schools displaying any asklepian less than western health professional schools (OR 0.22, 95% CI 0.06-0.80, \(P = .02\)).
Table 3. Display of asklepians and caducei among current emblems on Internet home pages of US and Canadian medical and other health professional schools in 2014.

| Schools                          | Longevity\(^a\), mean (SD, range) | Traditional asklepian, n (%) | Traditional or variant asklepian, n (%) | Traditional caduceus, n (%) | Traditional or variant caduceus, n (%) | Neither/both, n (%) |
|----------------------------------|-----------------------------------|-----------------------------|----------------------------------------|----------------------------|----------------------------------------|---------------------|
| All schools (n=482)              | 75.8 (58.5, 1-249)                | 36 (7.5)                    | 77 (16.0)                              | 7 (1.5)                    | 8 (1.7)                                | 397 (82.4)          |
| **Medical schools**              |                                   |                             |                                        |                            |                                        |                     |
| All (n=159)                      | 98.5 (61.3, 1-249)                | 5 (3.1)                     | 23 (14.5)                              | 4 (2.5)                    | 4 (2.5)                                | 132 (83.0)          |
| US\(^b\)(n=137), PR\(^c\)(n=4) | 97.7 (62.0, 1-249)                | 5 (3.5)                     | 22 (15.6)                              | 4 (2.8)                    | 4 (2.8)                                | 115 (81.6)          |
| Canada (n=18)                    | 104.5 (58.1, 9-185)               | 0 (0)                       | 1 (6)                                  | 0 (0)                      | 0 (0)                                  | 17 (94)             |
| **Medical schools: region**      |                                   |                             |                                        |                            |                                        |                     |
| Northeast (n=44)                 | 119.9 (72.8, 1-249)               | 2 (5)                       | 8 (18)                                 | 0 (0)                      | 0 (0)                                  | 36 (82)             |
| Midwest (n=33)                   | 97.9 (53.2, 1-178)                | 0 (0)                       | 5 (15)                                 | 1 (3)                      | 1 (3)                                  | 27 (82)             |
| South (n=56)                     | 87.9 (58.8, 2-207)                | 1 (2)                       | 7 (13)                                 | 1 (2)                      | 1 (2)                                  | 48 (86)             |
| West (n=26)                      | 86.0 (47.0, 6-195)                | 2 (8)                       | 3 (12)                                 | 2 (8)                      | 2 (8)                                  | 21 (81)             |
| **Other health professional schools** |                                   |                             |                                        |                            |                                        |                     |
| All (n=323)                      | 65.8 (53.5, 1-1931)               | 31 (9.6)                    | 54 (16.7)                              | 3 (0.9)                    | 4 (1.2)                                | 265 (82.0)          |
| US (n=287), PR (n=3)             | 65.1 (53.8, 1-1931)               | 30 (10.3)                   | 52 (17.9)                              | 2 (0.7)                    | 3 (1.0)                                | 235 (81.0)          |
| Canada (n=33)                    | 71.8 (44.0, 5-154)                | 1 (3)                       | 2 (6)                                  | 1 (3)                      | 1 (3)                                  | 30 (91)             |
| **Other health professional schools: region** |                                   |                             |                                        |                            |                                        |                     |
| Northeast (n=78)                 | 74.3 (55.3, 1-193)                | 2 (3)                       | 5 (6)                                  | 1 (1)                      | 1 (1)                                  | 72 (92)             |
| Midwest (n=75)                   | 86.9 (49.3, 1-164)                | 5 (7)                       | 9 (12)                                 | 0 (0)                      | 0 (0)                                  | 66 (88)             |
| South (n=106)                    | 51.7 (46.7, 1-173)                | 9 (8.5)                     | 16 (15.1)                              | 0 (0)                      | 0 (0)                                  | 90 (84.9)           |
| West (n=64)                      | 53.9 (46.1, 1-144)                | 15 (23)                     | 24 (38)                                | 2 (3)                      | 3 (5)                                  | 37 (58)             |
| **Other health professional schools: osteopathic medicine** |                                   |                             |                                        |                            |                                        |                     |
| All (n=40)                       | 32.3 (33.6, 1-122)                | 10 (25)                     | 14 (35)                                | 1 (3)                      | 1 (3)                                  | 25 (63)             |
| US (n=34)                        | 33.1 (36.2, 1-122)                | 10 (29)                     | 14 (41)                                | 0 (0)                      | 0 (0)                                  | 20 (59)             |
| Canada (n=6)                     | 27.5 (11.7, 11-33)                | 0 (0)                       | 0 (0)                                  | 1 (17)                     | 1 (17)                                 | 5 (83)              |
| **Other health professional schools: veterinary medicine** |                                   |                             |                                        |                            |                                        |                     |
| All (n=35)                       | 82.5 (45.5, 16-162)               | 6 (17)                      | 10 (29)                                | 0 (0)                      | 0 (0)                                  | 25 (71)             |
| US (n=30)                        | 82.8 (45.0, 16-162)               | 6 (20)                      | 9 (30)                                 | 0 (0)                      | 0 (0)                                  | 21 (70)             |
| Canada (n=5)                     | 81.0 (58.3, 28-152)               | 0 (0)                       | 1 (20)                                 | 0 (0)                      | 0 (0)                                  | 4 (80)              |
| **Other health professional schools: podiatric medicine** |                                   |                             |                                        |                            |                                        |                     |
| All (n=10)                       | 60.9 (47.2, 5-119)                | 1 (1)                       | 4 (40)                                 | 0 (0)                      | 0 (0)                                  | 6 (60)              |
| USA (n=9)                        | 66.6 (47.1, 5-119)                | 1 (1)                       | 4 (44)                                 | 0 (0)                      | 0 (0)                                  | 5 (56)              |
| Canada (n=1)                     | 10.0 (N/A\(^d\))                 | 0 (0)                       | 0 (0)                                  | 0 (0)                      | 0 (0)                                  | 1 (100)             |
| **Other health professional schools: dentistry** |                                   |                             |                                        |                            |                                        |                     |
| All (n=74)                       | 80.7 (47.9, 1-174)                | 5 (7)                       | 7 (9)                                  | 1 (1)                      | 1 (1)                                  | 66 (89)             |
| US (n=64), PR (n=1)              | 80.2 (49.7, 1-174)                | 5 (8)                       | 7 (11)                                 | 1 (2)                      | 1 (2)                                  | 57 (88)             |
| Canada (n=9)                     | 83.8 (40.5, 43-139)               | 0 (0)                       | 0 (0)                                  | 0 (0)                      | 0 (0)                                  | 9 (100)             |
| **Other health professional schools: pharmacy** |                                   |                             |                                        |                            |                                        |                     |
### Discussion

To our knowledge, this is the first systematic analysis of asklepian and caduceus prevalence among Internet images of medical and kindred health professional school emblems. We found that all schools’ emblems displayed the asklepian substantially more than the caduceus. This result supports the historically grounded preference for the asklepian as the symbol for healing and medicine, at least among all medical and other health professional schools, although inconsistency persists even within the constituency most expected to exemplify accurate understanding.

Human allopathic medicine in the Greco-Roman tradition appears to be the most direct descendant of Asklepios [44], yet medical schools are no more likely than health professional schools to display the traditional or any asklepian and are more likely to display the caduceus. The opportunity to improve education for correct symbol use clearly exists, as supported by the recent survey finding that only 6% of doctors knew that the asklepian is the correct symbol of medicine [14]. Medical schools and the profession can relearn and teach themselves, then promote to the public, that the asklepian represents their link to the long tradition of the healing arts and sciences.

Loss of the staff in emblems with variant asklepians may reflect not only creativity in branding, but also misunderstanding of the symbol. The staff and the serpent are a unified representation of healing through regeneration—relevant in the current era of organ, tissue, and cell transplantation. Creative use of variants can also perpetuate or increase confusion, as in the examples of the single serpent around a winged staff (Figure 2, c [30] and of the double helix conflated with the serpent symbol (Figure 2, h [35].

Fewer than 20% of current medical school and health professional school emblems in this study displayed either symbol, a finding that suggests diminished relevance of ancient symbols to the current identities of all health professional schools. Most of the schools in this study displaying neither symbol carry the crest or logo of their sponsoring universities. Health professional schools can brand their unique mission by displaying an asklepian alongside their university acronyms or insignia.

This cross-sectional study identified current symbol display, but it could not distinguish current from past symbol display. It could not identify symbol selection or change over time. For example, the Association of American Medical Colleges’ emblem has changed at least twice since 1970, culminating in the current variant asklepian (Figure 2, j [37] and k [38]). Also, we could not test Friedlander’s finding that, in contrast to medical professional organizations’ preference for the asklepian, “…76% of commercial organizations were more likely to use the caduceus” [6], an observation that supports anecdotal observation of current popular and media usage. This study does propose a novel symbol classification, and its results provide increased precision in measuring asklepian versus caduceus use over time.

Evaluating global symbol use by medical and health professional schools and other health-related organizations awaits further research. Many practitioners, private and governmental [45] health care enterprises and programs, news companies, Internet knowledge providers, and others erroneously brand medicine and health care with the caduceus. Health care organizations aligning for clinically and financially accountable care in the United States and elsewhere, especially those planning to rebrand, have the opportunity to unite with all health professional schools by incorporating the asklepian, traditional or variant, into their emblems as the single symbol of a shared, interdisciplinary mission of healing.
Acknowledgments
The primary author gratefully acknowledges the late Donald Bates, MD, Professor of History of Medicine at the McGill University Faculty of Medicine; the late Adalbert Erler, PhD, Professor of History of Law, the primary author’s grandfather, for awakening interest in the symbols of medicine and healing; and Dianne Gustafson for review of the manuscript.

This paper represents original, unfunded work not under consideration for publication elsewhere. Both authors meet criteria for authorship; no one else has contributed to this work. The work performed for this article by the second author is not endorsed by, nor does it represent her work at, either of her affiliations.

Conflicts of Interest
None declared.

Multimedia Appendix 1
Criteria for symbol definition and examples of traditional and variant asklepians and caducei.

[PDF File (Adobe PDF File), 465KB-Multimedia Appendix 1]

Multimedia Appendix 2
Current and past asklepians and caduceus symbols in emblems of medical schools.

[PDF File (Adobe PDF File), 957KB-Multimedia Appendix 2]

Multimedia Appendix 3
Current and past asklepians and caduceus symbols in emblems of other health professional schools.

[PDF File (Adobe PDF File), 214KB-Multimedia Appendix 3]

References
1. Wilcox RA, Whitham EM. The symbol of modern medicine: Why one snake is more than two. Ann Intern Med 2003 Apr 15;138(8):673-677. [Medline: 12693891]
2. Claridge A. Rome: An Oxford Archaeological Guide. Oxford, UK: Oxford University Press; 1998.
3. Nayernouri T. Asclepius, Caduceus, and Simurgh as medical symbols, part I. Arch Iran Med 2010 Jan;13(1):61-68 [FREE Full text] [Medline: 20039773]
4. Garrison F. The use of the caduceus in the insignia of the army medical officer. Bull Med Libr Assoc 1919 Oct;9(2):13-16 [FREE Full text] [Medline: 16015887]
5. McCulloch C. The coat of arms of the Medical Corps. Mil Surg 1917;41:137-148.
6. Friedlander WJ. The Golden Wand of Medicine: A History of the Caduceus Symbol in Medicine. New York, NY: Greenwood Press; 1992.
7. The Chapman Society, College of Medicine. Gainesville, FL: University of Florida What’s in a symbol? URL: http://humanism.med.ufl.edu/chapman-projects/art-of-medicine-project-2005-2006/whats-in-a-symbol/ [accessed 2016-01-10] [WebCite Cache ID 6eQrxwYO8]
8. Sacks AC, Michels R. Images and Asclepius. Caduceus and Asclepius: History of an error. Am J Psychiatry 2012 May;169(5):464. [doi: 10.1176/appi.ajp.2012.11121800] [Medline: 22549207]
9. Pearn J. Agathos Daimon and the Asklepiian serpent. Vesalius 2011 Jun;17(1):4-9. [Medline: 22043596]
10. Wikipedia. Hippocrates URL: https://en.wikipedia.org/wiki/Hippocrates [accessed 2016-01-10] [WebCite Cache ID 6eQsMavAQ]
11. Edelstein L. The Hippocratic Oath: Text, Translation, and Interpretation. Baltimore, MD: Johns Hopkins University Press; 1943.
12. Schouten J. The Rod and the Serpent of Asklepios. Amsterdam, the Netherlands: Elsevier; 1967.
13. Grainger B. A survey of symbols of medicine and veterinary medicine. In:Proceeds of the 8th International Congress on Medical Librarianship. 2000 Jul 05 Presented at: 8th International Congress on Medical Librarianship; July 2-5, 2000; London, UK URL: https://research.libraries.wsu.edu/xmlui/bitstream/handle/2376/1991/Grainger%20Survey%20of%20Symbols.pdf?sequence=1[WebCite Cache ID 6eQuNWkhw]
14. Shetty A, Shetty S, Dsoouza O. Medical symbols in practice: Myths vs reality. J Clin Diagn Res 2014 Aug;8(8):PC12-PC14 [FREE Full text] [doi: 10.7860/JCDR/2014/10029.4730] [Medline: 25302742]
15. Association of American Medical Colleges. Member directory search result - Medical school URL: https://members.aamc.org/eweb/DynamicPage.aspx?site=AAMC&webcode=AAMCOrgSearchResult&orgtype=Medical%20School[WebCite Cache ID 6eQuNWkhw]
16. American Association of Colleges of Osteopathic Medicine. US colleges of osteopathic medicine URL: http://www.aacom.org/become-a-doctor/us-coms [accessed 2016-01-10] [WebCite Cache ID 6eQuU5SzL]
17. Ontario Association of Osteopathic Practitioners. Accredited schools URL: http://www.osteopathicboard.org/accredited-schools/ [accessed 2016-01-10] [WebCite Cache ID 6eQua3h4f]
18. Council on Podiatric Medical Education. List of podiatric medical colleges URL: http://www.cpme.org/colleges/content.cfm?ItemNumber=2425 [accessed 2016-01-10] [WebCite Cache ID 6eQuU15i]
19. Université du Québec à Trois-Rivières. Répertoire des programmes d'études URL: https://oraprdnt.uqtr.uquebec.ca/pls/public/pgmx001?owa_ed_pgms=7017 [accessed 2016-01-10] [WebCite Cache ID 6eQw5MOne]
20. Association of American Veterinary Medical Colleges. AAVMC members URL: http://www.aavmc.org/aavmc-members/full-member-listing.aspx [accessed 2016-01-10] [WebCite Cache ID 6eQwALAK4]
21. American Dental Association. Council on Dental Accreditation: Search for dental programs URL: http://www.ada.org/en/coda/find-a-program/search-dental-programs/dds-dmd-programs [accessed 2016-01-10] [WebCite Cache ID 6eQwPfpWA]
22. American Optometric Association. 2015 Mar 23. Accreditation Council on Optometric Education: Accredited professional optometric degree programs URL: http://www.aoa.org/Documents/students/OD_program_directory_3_23_2015.pdf [accessed 2016-01-10] [WebCite Cache ID 6eQwNyY18]
23. Canadian Association of Optometrists. Becoming a doctor of optometry URL: https://opto.ca/becoming-a-doctor-of-optometry [accessed 2016-01-10] [WebCite Cache ID 6eRT26AKL]
24. Accreditation Council for Pharmacy Education. Preaccredited and accredited professional programs of colleges and schools of pharmacy URL: https://www.aacp-accredit.org/shared_info/programsSecure.asp [accessed 2016-01-10] [WebCite Cache ID 6eOyfLMsAI]
25. Canadian Pharmacists Association. Canadian faculties and schools of pharmacy URL: http://www.pharmacists.ca/index.cfm/pharmacy-in-canada/directory-of-pharmacy-organizations/canadian-faculties-and-schools-of-pharmacy/[WebCite Cache ID 6eOyRlfzm]
26. Jing Y, Baluja S. Pagerank for product image search. In: Proceedings of the 17th International World Wide Web Conference (WWW2008). 2008 Apr Presented at: 17th International World Wide Web Conference (WWW2008); April 21-25, 2008; Beijing, China URL: http://csweb.ucsd.edu/~elkan/291spring2008/dafna2.pdf [WebCite Cache ID 6hJ2ZOA95]
27. Chitu A. Google Operating System. 2013 Jun 13. How Google's image recognition works URL: http://googlesystem.blogspot.com/2013/06/how-images-image-recognition-works.html [accessed 2016-01-10] [WebCite Cache ID 6eOyfTiq]
28. The Student National Medical Association. Region V SNMA chapters URL: http://www.snma.org/index.php?pID=89 [accessed 2016-01-10] [WebCite Cache ID 6eQzxG2AC]
29. YouTube. University of Wisconsin Medical Student Association (UW MSA) URL: https://www.youtube.com/user/uwiscmsa [WebCite Cache ID 6eRU9f6S8]
30. New York Medical College. URL: https://www.nymc.edu/ [accessed 2016-01-10] [WebCite Cache ID 6eR0Teo91]
31. Marquette University School of Dentistry Criminal Background Check Policy. Milwaukee, WI: Marquette University School of Dentistry URL: http://www.marquette.edu/dentistry/admissions/documents/CBC-policy.pdf [accessed 2016-04-12] [WebCite Cache ID 6gIGRai5]
32. Eventbrite. Chicago State University College of Pharmacy URL: http://www.eventbrite.com/o/chicago-state-university-college-of-pharmacy-1277511417 [accessed 2016-01-10] [WebCite Cache ID 6eRMgoTSQ]
33. Wikipedia. East Tennessee State University James H. Quillen College of Medicine URL: https://en.wikipedia.org/wiki/East_Tennessee_State_University_James_H._Quillen_College_of_Medicine [accessed 2016-01-10] [WebCite Cache ID 6eROUKcRM]
34. John A Burns School of Medicine. Honolulu, HI: John A Burns School of Medicine University of Hawai'i at Mānoa URL: http://jabsom.hawaii.edu/ [accessed 2016-01-10] [WebCite Cache ID 6eRObAODJ]
35. University of Illinois, College of Medicine. Chicago, IL: University of Illinois, College of Medicine Medical Scientist Training Program (MSTP) URL: http://chicago.medicine.uic.edu/education/masters_and_doctorate_programs/medical_scientist_training_program_m_s_t_p/ [accessed 2016-01-10] [WebCite Cache ID 6eROkGK5]
36. University of Ottawa, Faculty of Medicine. Ottawa, ON: University of Ottawa, Faculty of Medicine Our coat of arms URL: https://med.uottawa.ca/en/about/history/our-coat-arms [accessed 2016-01-10] [WebCite Cache ID 6eRUYO5Pq]
37. Trademarkia. AAMC American Association of Medical Colleges URL: http://www.trademarkia.com/aamc-association-of-american-medical-colleges-76505303.html [accessed 2016-01-10] [WebCite Cache ID 6eRRRezy2]
38. American Association of Colleges of Medicine URL: https://www.aamac.org/ [accessed 2016-01-10] [WebCite Cache ID 6eRRFVxe7]
39. Current Policies: Adopted 1954–2013. Chicago, IL: American Dental Association; 2014. Dental insigne URL: http://www.ada.org/~media/ADA/Member%20Center/Files/2013%20Current%20Policies%20Final.pdf [accessed 2016-01-10] [WebCite Cache ID 6eOvysmYs]
40. Smith W. A Dictionary of Greek and Roman Biography and Mythology. Boston, MA: Little, Brown and Co; 1867.
41. Pharmaceutical Symbols. London, UK: Museum of the Royal Pharmaceutical Society URL: http://www.rpharms.com/museum-pdfs/13-pharmaceutical-symbols.pdf [accessed 2016-01-10] [WebCite Cache ID 6eOzSFwxj]
42. Cohen J. A coefficient of agreement for nominal scales. Educ Psychol Meas 1960 Apr 01;20(1):37-46. [doi: 10.1177/00131644600200104]

43. United States Census Bureau. Geographic terms and concepts - Census divisions and census regions URL: https://www.census.gov/geo/reference/gtc/gtc_census_divreg.html [accessed 2016-01-10] [WebCite Cache ID 6eQzXTdF1]

44. Dana CL. The cult of Aesculapius, his statues and his temples. In: The Proceedings of the Charaka Club. Volume I. New York, NY: William Wood and Company; 1902:59-71.

45. The White House. Health care in America URL: https://m.whitehouse.gov/health-care-in-america/?utm_source=email&utm_medium=email&utm_content=email470-text1&utm_campaign=healthcare[WebCite Cache ID 6eQzhDOC6]

Abbreviations

| Abbreviation | Definition |
|--------------|------------|
| AAMC         | Association of American Medical Colleges |
| N/A          | not applicable |
| OR           | odds ratio |
| PR           | Puerto Rico |
| US           | the United States |

©Claus Hamann, MaryKate Martelon. Originally published in JMIR Medical Education (http://mededu.jmir.org), 25.05.2016. This is an open-access article distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/2.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work, first published in JMIR Medical Education, is properly cited. The complete bibliographic information, a link to the original publication on http://mededu.jmir.org/, as well as this copyright and license information must be included.