Acceptability of Fluzone Intradermal Vaccine to Patients and Vaccine Administrators

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Context: Fluzone Intradermal (ID) vaccine was licensed in the United States in May 2011 and uses a microinjection device with a 1.5-mm, 30-gauge needle that delivers a smaller volume and antigen load than the Fluzone Intramuscular (IM) vaccine. The same ID microinjection system has been used in Argentina and Australia since 2010 with documented acceptance by both patients and vaccine administrators.

Objectives: To evaluate the acceptability of Fluzone ID influenza vaccine in clinical practice in the United States among patients and vaccine administrators and to compare the ID and IM influenza vaccines in terms of patient preference, preinjection anxiety, postinjection pain, and vaccine selection in future years.

Methods: The authors developed 3 surveys—an initial and a follow-up survey for recipients of the ID vaccine and another survey for administrators—to assess opinions of ID administration. Vaccine recipients were surveyed at the time of injection concerning vaccine acceptability, vaccine preference, preinjection anxiety, and postinjection pain. Recipients who had received the IM influenza vaccine within the past 3 years were asked to compare the ID vaccine with their prior IM vaccine experience. Vaccine administrators were also surveyed after administering the ID vaccine at their assigned clinic. Recipients were then surveyed 7 days later.

Results: Vaccine clinic participants were offered 3 vaccines: the ID and the IM Fluzone vaccines and Flumist (Medimmune) intranasal vaccine. Of the 367 participants vaccinated, 249 (67.8%) chose the ID vaccine and 117 (31.9%) chose the IM vaccine. Immediately after ID vaccination, 234 of 235 recipients (99.6%) reported being satisfied with the method of administration. One hundred seventy-five of 178 ID vaccine recipients (99.4%) who had also received the IM vaccine in the past 3 years reported being satisfied. Previous IM recipients reported a preference for the ID vaccine over the IM vaccine. They also reported less preinjection anxiety and postinjection pain compared with the IM vaccine administration, both immediately and 7 days after vaccination. All vaccine administrators reported satisfaction with the ID vaccine.

Conclusion: The current study demonstrates the overall acceptability of the Fluzone ID vaccine in clinical practice in the United States by both patients and vaccine administrators. Additionally, the study is the first to our knowledge to document a patient preference for ID influenza vaccine over IM influenza vaccine.

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Influenza is a major cause of morbidity and mortality throughout the world, resulting in thousands of deaths each year in the United States.[1] In addition, influenza produces a substantial economic burden.[2] Currently, there are 3 vaccine delivery systems available in the United States: intramuscular (IM), nasal, and intradermal (ID). All 3 vaccines are recommended by the Advisory Committee on Immunization Practices (ACIP) of the Centers for Disease Control and Prevention without preference for nonpregnant healthy adults, within specified age indications.[3]

Immunization is the most effective means to reduce the disease burden of influenza.[2] The ACIP recommends annual influenza vaccination for all persons in the United States who are 6 months of age or older.[3] Healthy People 2020 has set goals of annual coverage rates of 80% in persons aged 6 months through 64 years without high-risk conditions and 90% for adults aged 18 to 64 years with high-risk conditions, including persons living in long-term care facilities or nursing homes.[4] Despite substantial data on the influenza disease burden and implementation of universally recommended ACIP influenza vaccine guidelines, influenza vaccine coverage rates remain far below the Healthy People 2020 goals. For the 2009-2010 influenza season, surveillance estimates of coverage were only 45.3% for high-risk adults and 48.8% for all persons aged 6 months or older.[5]

Fear of needles is one of the reasons that vaccine recipients[6] and health care workers[7] alike avoid or decline the influenza vaccine. Within the past 2 years, a vaccine delivery system designed for minimal needlestick was introduced to the United States. The ID influenza vaccine (Fluzone Intradermal, Sanofi Pasteur Inc, Swiftwater, Pennsylvania) was licensed in the United States in May 2011. The vaccine is administered in the dermis by using a 1.5-mm, 30-gauge needle.

The dermis is an immunologically rich area, and studies[8,9] have shown that the ID vaccine has an immunologic effect similar to that of the IM vaccine. Systemic adverse events were also similar for both the ID and the IM vaccines.[9] With the exception of pain, other solicited injection-site reactions were reported more frequently after the ID vaccine compared with the IM vaccine.[9] Additionally, the ID vaccine uses a smaller volume (0.1 mL) and antigen load (27 µg total) compared with the IM vaccine (volume, 0.5 mL; antigen load, 45 µg total). A similar vaccine—Intanza 9 µg (Sanofi Pasteur Inc, Lyon, France)—is delivered with the same ID microinjection system as Fluzone ID vaccine. Intanza vaccine has been used in Argentina and Australia since 2010. Whereas Eizenberg et al[10] documented high rates of acceptance by both patients and vaccine administrators in these countries, they did not attempt to compare the rates of acceptability of the ID vaccine with that of the IM vaccine.

The IM route is the dominant method of vaccination in the United States. To our knowledge, acceptability of the ID route has not been assessed in clinical practice in the United States. The present study evaluated the acceptability of the Fluzone ID vaccine by adult participants and vaccine administrators in the United States. It also compared the ID and IM routes of vaccination in terms of various characteristics including vaccine preference, speed of vaccination, anxiety, and postinjection pain.

Methods

We developed 3 surveys to evaluate acceptability of the Fluzone ID and Fluzone IM vaccines: 2 surveys (initial and follow-up) for participants who chose the ID vaccine and 1 survey for administrators. In addition to questions about overall acceptability, recipients who had received the IM vaccine in the past 3 years were asked to compare their current experience with the ID vaccine in light of their previous experience with the IM vaccine; in this manner, these recipients served as their own control group. The current study was approved by the Touro University California (TUC) Institutional Review Board on August 1, 2011 (IRB number M-0611). Informed consent was obtained from all study participants prior to vaccination.

Every fall, the TUC Student Health Services department holds voluntary influenza clinics for its students,

as well as faculty and staff. Influenza immunization is encouraged but not required. The university covers all vaccine and administration costs. Vaccines are usually administered by osteopathic physicians, osteopathic medical students, nurse practitioners, doctorate degree pharmacists, and pharmacy doctorate students. For the 2011-2012 influenza season, traditional IM vaccine (Fluzone), intranasal vaccine (Flumist), and ID vaccine (Fluzone ID) were offered at 6 influenza clinics held on campus.[9,10] Students, faculty, and staff were notified about these clinics by means of e-mail and flyers posted on campus that contained the following information: (1) location and hours of vaccine clinics; (2) vaccines offered; and (3) a brief description of the Fluzone ID vaccine (eg, smaller, shorter needle; safety and immune response similar to that of traditional Fluzone) and the 2 short vaccine recipient surveys. The TUC Student Health Services department entered students who completed both surveys into a random drawing for a Nook eReader. Fluzone ID vaccine was provided at no cost by Sanofi Pasteur.

The current study was conducted in Northern California during October and November 2011. At the clinics, participants opting for the ID vaccine were once again given the brief description of the ID vaccination. All vaccine recipients were given an influenza vaccine information statement from the Centers for Disease Control and Prevention to review. Prior to vaccination, all ID vaccine recipients were asked to complete a self-administered, 2-stage demographic survey (ie, initial survey and follow-up survey) with questions about their past experience with the IM vaccine. Both stages of the survey asked recipients about their satisfaction with the ID method immediately after vaccination. Recipients of the ID vaccine who reported receiving the IM influenza vaccine in the past 3 years were asked to respond to additional questions comparing both administration methods. The surveys were preprinted with study identification numbers. They included a preprinted tear-away portion for participants to keep track of their study identification numbers.

Vaccine administrators were also asked to assess their satisfaction with the ID vaccine administration just after injecting it. All had given the traditional IM influenza vaccine in the past and administered a minimum of 5 Fluzone ID injections during the present study. Students were directly supervised by TUC clinical faculty. The vaccine administrators were asked to describe their overall level of satisfaction with the ID vaccine. They were also asked if they had previously administered IM vaccines and, if so, to compare ID administration with IM administration on the basis of the following factors: preparation of the injection, ease of administration, time required to administer the vaccine, safety and perceived risk of needlestick injury for the vaccine administrator and patient, and overall preferability of ID vs IM vaccine. Finally, vaccine administrators were asked to rate their satisfaction (very satisfied, satisfied, or not satisfied) with the ID vaccine administration.

Seven days after vaccination, participants were asked to complete a second survey (ie, follow-up survey) on a website. Participants were sent an e-mail to remind them of the follow-up survey. The follow-up survey assessed the vaccine recipients' overall satisfaction with the ID vaccine and their vaccine preference (ID or IM) for future influenza vaccine doses. Participants who had received intramuscular influenza vaccine in the past 3 years were also asked to compare the ID vaccine with the IM vaccine. Participants were asked to enter their study ID number from the first survey to match participant responses from initial survey to those from the follow-up survey.

The Fischer exact test and the χ^2 test were used to determine any statistically significant relationships between baseline demographic factors and vaccine satisfaction, as well as perceptions of pain, anxiety preceding vaccination, and speed of injection. We used SPSS statistical software (version 17.0; IBM Corp, Armonk, New York) to perform statistical analyses.

Results

From a convenience sample of students, faculty, and staff, a total of 367 participants received the influenza vaccine at the 6 vaccine clinics. Participants were offered 3 influenza products; 249 (67.8%) chose to receive Flu-

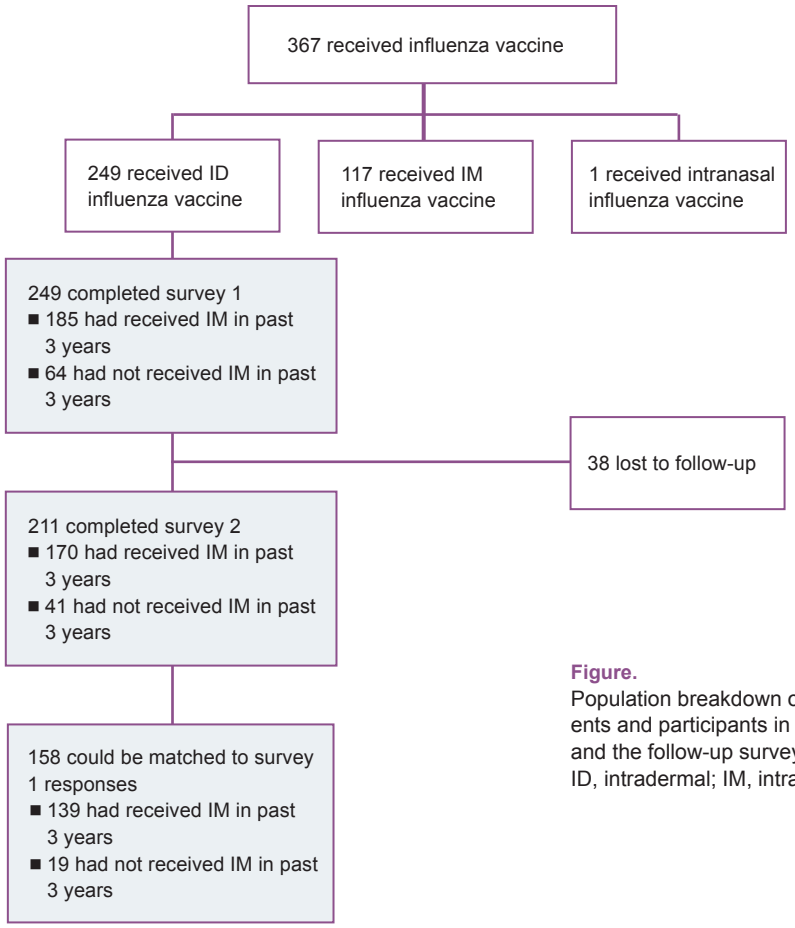

Figure.
Population breakdown of vaccine recipients and participants in the initial survey and the follow-up survey. *Abbreviations:* ID, intradermal; IM, intramuscular.

zone ID vaccine, 117 (31.9%) chose to receive Fluzone IM vaccine, and 1 (0.3%) chose to receive the Flumist vaccine (*Figure*).

Initial Survey

Demographic data showed that of 249 recipients, 116 (46.6%) were men and 133 (53.4%) were women; 189 (75.9%) were aged 18 to 35 years, largely reflecting the participation of the student population (*Table 1*).

Overall, 234 of 235 initial survey respondents (99.6%) were satisfied with the ID experience immediately after vaccination (*Table 2*). Of the 178 ID vaccine recipients who had previously received the IM vaccine and who answered the satisfaction question, 177 recipients (99.4%) reported being satisfied (*Table 3*). Accordingly, there was no difference in the percentage of respondents who reported being "very satisfied" with the ID vaccine between respondents who had received the IM vaccine in the past 3 years (n=178) and those who had not (n=57) (163 [92%] versus 53 [93%], respectively; $P=.49$)

Intradermal vaccine recipients who received the IM influenza vaccine within the past 3 years were asked to compare the 2 administration techniques. Overall, a greater proportion of recipients aged 50 to 64 years (30 of 35 [86%]) received the IM influenza vaccine in the past 3 years than recipients aged 18 to 35 years (135 of 189 [71%]) and recipients aged 36 to 49 years (20 of 25 [80%]) ($P=.16$). Men (102 of 133 [77%]) and women (83 of 116 [72%]) had similar rates of receiving the IM vaccine in the past 3 years ($P=.36$). A greater proportion of faculty (39 of 43 [91%]) received the traditional IM

Table 1.
No. (%) of Fluzone Intradermal Recipients Who Responded to Initial Survey or Who Responded to Initial Survey and Follow-up Survey

Characteristic	Initial Survey (n=249)	Initial Survey and Follow-up Survey Matched (n=158)
Sex		
Women	133 (53.4)	85 (53.8)
Men	116 (46.6)	73 (46.2)
Age, y		
18-35	189 (75.9)	112 (70.9)
36-49	25 (10.0)	16 (10.1)
50-65	35 (14.1)	30 (19.0)

Table 2.
No. (%) of Fluzone Intradermal Recipients Who Responded to Overall Satisfaction Question on Initial Survey

Response	Immediately After Vaccination (n=249)	1 Week After Vaccination (n=211)
Very Satisfied	216 (91.9)	107 (50.7)
Somewhat Satisfied	18 (7.7)	79 (37.5)
Not Satisfied	1 (0.4)	25 (11.8)
Did Not Answer	14	0

vaccine in the past 3 years than did students (127 of 180 [71%]) and staff (19 of 26 [73%]) (P=.25) (*Table 4*).

Of the 185 recipients of the ID vaccine who had received the IM vaccine in the past 3 years, 98 recipients (53.8%) experienced less pain immediately after ID injection than with IM injection, 63 recipients (34.7%) described the pain as the same, and 21 recipients (11.5%) experienced more pain (*Table 5*). Similarly, 69 recipients (37.9%) reported better control of anxiety before injection, and 112 recipients (61.6%) rated anxiety as the same with both vaccines. When asked about the speed of vaccination, 108 recipients (59.3%) ranked ID administration as faster than IM administration, and 70 recipients (38.5%) regarded the speed of the 2 types of administration as the same (*Table 5*). Neither gender nor age was a statistically significant factor in recipients' beliefs about vaccine acceptability, pain, anxiety prior to administration, or speed of vaccination (*Table 6* and *Table 7*). In addition, 98 recipients (53.8%) preferred the ID vaccine to the IM vaccine, and 101 recipients (55.5%) reported that they would take the ID vaccine next year (*Table 8* and *Table 9*). As expected, pain perception caused a statistically significant difference in preference: of the 111 participants who considered the pain of the ID vaccination "better" than that of the IM vaccination, 90 recipients (81%) reported that they would be more likely to get the ID vaccine in subsequent years, whereas 25 of 97 recipients (37%) who thought the pain of ID vaccination was the same or worse would opt for the IM vaccination (P<.001).

Follow-Up Survey

Seven days after ID vaccine receipt, study participants were again surveyed, and 211 of 249 initial respondents (84.7%) completed the follow-up survey. Overall satisfaction for all responding ID vaccine recipients was reported for 186 of 211 recipients (88.2%), and for 147 of 170 recipients (86.5%) who had received the IM vaccine in the past 3 years (*Table 2* and *Table 3*).

Unfortunately, some recipients did not include their study identification number with their follow-up survey responses. As a result, only 158 recipients of the follow-up survey could be matched to their responses in the initial survey. There were 149 participants responding to the follow-up survey who were either "very satisfied" or "somewhat satisfied" with the vaccine immediately after vaccination. Of those, 19 (12.8%) recipients changed their response to "not satisfied" on the follow-up survey, accounting for the decrease in overall satisfaction between the 2 surveys (P=.13). Those same 19 respondents accounted for the change in overall satisfaction among those who had received the IM vaccine in the past 3 years.

As reported in the follow-up survey, 169 recipients had received the IM vaccine in the past 3 years before opting to receive the ID vaccine. Of these, 75 recipients (44.4%) described the pain as better with the ID vaccine,

47 recipients (27.8%) rated the pain as the same, and 47 recipients (27.8%) rated the pain as worse. Similarly, injection anxiety was rated as better with the ID vaccine by 72 of 169 recipients (42.6%) and the same for both IM and ID vaccines by 95 of respondents (56.2%) (*Table 5*). More recipients who were "somewhat satisfied" or "very satisfied" considered the pain of the ID vaccine "better than IM" or "the same as IM" (74.7%) compared with those who were "not satisfied" (56.5%, $P=.07$). The 99.2% of recipients who were "somewhat satisfied" or "very satisfied" considered the anxiety to be "the same as IM" or "better than IM." This finding was comparable to those who reported being "not satisfied" with the vaccine, of whom 100% thought the anxiety related to the vaccine was "the same as IM" or "better than IM" ($P=.69$). Finally, 91.1% of those who were "somewhat satisfied" or "very satisfied" with the ID vaccine thought the speed of administration was "the same as IM" or "better than IM" compared with 82.6% of those who reported being "not satisfied" with the ID vaccine ($P=.07$) (*Table 10*).

Of the 19 recipients who reported being "not satisfied" with the ID vaccine on the follow-up survey, despite reporting being satisfied immediately after vaccination, 6 (32%) thought that the pain was worse than with IM, all 19 thought the anxiety was the same or better, and 3 (16%) thought the speed of administration was worse than with IM (*Table 5*).

Administrator Survey

The administrator survey was given to 8 participants: 4 osteopathic physicians, 1 doctorate degree pharmacist, 1 nurse practitioner, and 2 osteopathic medical students. All had administered the traditional IM influenza vaccine in the past and administered a minimum of 5 Fluzone ID injections during the present study. All administrators reported being satisfied with the ID vaccine administration experience. The most common reasons for their satisfaction with the ID vaccine were vaccination safety in terms of potential needlestick injury for vaccinator and patient and speed of administration. Compared with IM administration, the ID administration was rated to be equivalent or better in terms of preparation of the injection and ease of administration (*Table 11*).

Table 3.
No. (%) of Fluzone Intradermal Recipients Who Received Intramuscular Vaccine in the Past 3 Years and Who Responded to Overall Satisfaction Question on Initial Survey

Response	Immediately After Vaccination (n=185)	1 Week After Vaccination (n=170)
Very Satisfied	163 (91.5)	84 (49.4)
Somewhat Satisfied	14 (7.9)	63 (37.1)
Not Satisfied	1 (0.6)	23 (13.5)
Did Not Answer	7	0

Table 4.
No. (%) of Participants Who Did or Did Not Receive the IM Vaccine in the Past 3 Years

Characteristic	Received IM	Did Not Receive IM
Sex		
Women (n=116)	83 (71.6)	33 (28.4)
Men (n=133)	102 (76.7)	31 (23.3)
Age, y		
18-35 (n=189)	135 (71.4)	54 (28.6)
36-49 (n=25)	20 (80)	5 (20)
50-65 (n=35)	30 (85.7)	5 (14.3)
Position		
Student (n=180)	127(70.6)	53 (29.4)
Staff (n=26)	19 (73.1)	7 (26.9)
Faculty (n=43)	39 (90.7)	4 (9.3)

Abbreviation: IM, intramuscular.

Comment

This survey-based study evaluated the acceptance of the ID method of vaccination by both recipients and administrators in the United States. When presented with the choice of the ID, IM, or nasal route of vaccine administration, 67.8% of persons presenting to our vaccine

Table 5.
Perceptions of ID vs IM Injection for Participants of Both Surveys Who Had Received IM Vaccine in the Past 3 Years, No. (%)

Participant Time and Aspect	Better Than IM	Same as IM	Worse Than IM
Immediately After Injection (n=185)			
Injection pain	98 (53.8)	63 (34.7)	21 (11.5)
Anxiety before injection	69 (37.9)	112 (61.6)	1 (0.5)
Speed of injection	108 (59.3)	70 (38.5)	4 (2.2)
One Week After Injection (n=169)			
Injection pain	75 (44.4)	47 (27.8)	47 (27.8)
Anxiety before injection	72 (42.6)	95 (56.2)	1 (0.1)
Speed of injection	74 (43.8)	78 (46.2)	17 (10.0)
One Week After Injection Who Changed From "Satisfied" to "Not Satisfied" on Follow-up Survey (n=19)			
Injection pain	3 (15.8)	10 (52.6)	6 (31.6)
Anxiety before injection	6 (31.6)	13 (68.4)	0 (0)
Speed of injection	4 (21.1)	12 (63.2)	3 (15.8)

Abbreviations: ID, intradermal; IM, intramuscular.

clinics chose the ID route. This finding demonstrates the initial acceptability of this new vaccine administration technique by patients in the United States. This preference may reflect patient concern with IM administration pain. Or, it may represent increased interest in a novel method of administration, the description of which (shorter needle) may have suggested the potential for less injection discomfort. In previous TUC annual influenza vaccine clinics, where only the IM and intranasal vaccines were offered, a greater percentage of recipients chose the intranasal route (34% in the 2009-2010 influenza season) of administration compared with the vaccine clinic of the present study's year (2011-2012 influenza season). Thus, our data suggest that the participants who might previously have chosen the intranasal route in the past chose this year to take the ID route.

Immediately after receiving the Fluzone ID vaccine, the overall satisfaction rate for all recipients was extremely high (99.6%). This rate compares favorably with the ID influenza vaccine satisfaction rates in Australia and Argentina (98% in both countries).[10] Seven days after receiving the ID vaccine, the overall satisfaction rate was still high but had fallen to 88.2%. This decrease in satisfaction may be a result of the known increase in injection-site reactions seen with the ID vaccine.[9] Nevertheless, satisfaction rates among all ID vaccine recipients were high at both survey intervals.

Our study is the first, to our knowledge, to attempt to compare directly vaccine acceptability of ID vs IM influenza vaccines in clinical practice.[9] We chose to assess a subgroup of participants who had received the IM vaccine within the past 3 years to compare their experiences

Table 6.
Sex-Based Differences in Perceptions of Initial Survey Participants (n=185) Who Received Intramuscular Vaccine in the Past 3 Years, No. (%)

Perception	Men (n=102)	Women (n=83)	*P* Value	No Response
Very or Somewhat Satisfied[a]	96 (98.9)	81 (100)	.55	7
Pain Was Better or the Same[b]	85 (85)	76 (92.7)	.08	3
Anxiety Was Better or the Same[b]	100 (100)	81 (98.8)	.45	3
Speed Was Better or the Same[b]	99 (99)	79 (96.3)	.24	3

[a] No responses from 5 men and 2 women; n=97 and n=81, respectively.
[b] No responses from 2 men and 1 women; n=100 and n=82, respectively.

Table 7.
Age-Based Differences in Perceptions of Initial Survey Participants (n=185) Who Received Intramuscular Vaccine in the Past 3 Years, No. (%)

Perception	18-35 y (n=135)	36-65 y (n=50)	*P* Value	Missing
Very or Somewhat Satisfied[a]	129 (99.2)	48 (100)	.73	7
Pain Was Better or the Same[b]	117 (87.9)	44 (89.8)	.48	3
Anxiety Was Better or the Same[b]	132 (99.2)	49 (100)	.73	3
Speed Was Better or the Same[b]	130 (97.7)	48 (97.9)	.71	3

[a] No responses from 5 participants from 18- to 35-year age group and 2 from the 36- to 65-year age group; n=130 and n=48, respectively.
[b] No responses from 2 participants from the 18- to 35-year age group and 1 from the 36- to 65-year age group; n=133 and n=49, respectively.

with the ID and IM methods. We believed that participants' experiences with the IM vaccine would make this comparison more valid, although recall bias is a potential limitation of this study. For this subgroup of participants (74.3%), the satisfaction rate of 99.4% was similar to the satisfaction rate of all recipients (99.6%). When this subgroup was asked to compare their ID vaccine experience with their prior IM vaccine experience, the majority preferred the ID vaccine and reported that they would choose to receive the ID vaccine next year (*Table 7* and *Table 8*). Although rates of vaccine preference decreased and rates of vaccine-induced pain increased during the 7 days after injection, the ID vaccine was still preferred more than the IM vaccine.

Among our vaccine administrators, all 8 reported being either very satisfied or satisfied with the ID vaccine technique. It should be noted that 4 of the 8 vaccine administrators are the authors of this article, opening up the possibility for potential bias. However, the satisfaction rate is the same even after removing the potentially biased surveys. This rate compares favorably with the rates in the Australian and Argentinean ID vaccine experience, in which 85% of vaccine administrators rated the ID vaccine administration as either satisfactory or very satisfactory.[10] The most common reason for satisfaction in our study was the perceived potential for increased vaccine administration safety, especially in reduction of needlestick injuries. Experienced vaccine administrators, who may vaccinate thousands of people over the course of many years, have a relatively high risk of needlestick injuries to themselves and their patients, and the potential increase in vaccine administration safety would prove to be an additional benefit to this method of injection.

Limitations of our study include the relatively small sample size and single center in which the study was conducted. These limitations potentially limit the external validity and generalizability of the data. However, much of the data collected compare favorably with data of prior studies that have been completed in other countries. This favorability attests to the reliability of the data that were collected. Large-scale, multicenter studies, however, should be conducted to explore further the public's and vaccinators' responses to the ID method of vaccination. As mentioned earlier, we, the authors of the present article, were also administrators, receiving and delivering the vaccine. We affirm, however, that the results that were collected remained statistically un-

Table 8.
Vaccine Injection Method Preferred This Year by Participants Who Received the Intramuscular Vaccine in the Past 3 Years, No. (%)

Preference	Initial Survey (n=185)	Follow-Up Survey (n=170)
Intradermal	98 (53.8)	68 (40.7)
Intramuscular	8 (4.4)	54 (32.3)
No Preference	60 (33.0)	40 (24)
Unsure	16 (8.8)	5 (3)
Did Not Respond	3	3

Table 9.
Vaccine Injection Method Preferred for Next Year by Participants Who Received the Intramuscular Vaccine in the Past 3 Years, No. (%)

Preference	Initial Survey (n=185)	Follow-Up Survey (n=170)
Intradermal	101 (55.5)	66 (38.8)
Intramuscular	7 (3.8)	56 (32.9)
No Preference	59 (32.4)	39 (22.9)
Unsure	15 (8.3)	9 (5.4)
Did Not Respond	3	0

changed even when our potentially biased survey responses were removed from consideration.

Another limitation of the study was that 53 participants did not correctly enter their study identification numbers when completing the follow-up survey. As a result, these participants' data were not included in analyses comparing responses to initial and follow-up surveys. This omission limited the effective sample size of these analyses. Another potential limitation of the study is that the ID vaccine and the ID administration systems were supplied by the vaccine manufacturer. However, the vaccine manufacturer did not otherwise participate in the study, whether in participant selection, data collection, data analysis, or study logistics and participant communications.

The next steps in the ID vaccine evaluation might be enriched by any of the following: (1) using larger vaccine recipient and vaccine administrator groups from varied community sites, (2) including an osteopathic manipulative medicine research study arm to assess its effect on vaccine acceptability, or (3) further assessing of the effect of local injection site reactions on patient acceptability.

Table 10.
Responses to Follow-Up Survey by Participants Reporting Satisfaction and Perception of Intradermal Vaccine vs Intramuscular Vaccine, No. (%)

Perception	Very Satisfied (n=84)	Satisfied (n=62)[a]	Not Satisfied (n=23)
Pain			
Better	58 (69.1)	14 (22.6)	3 (13.0)
Same	18 (21.4)	19 (30.7)	10 (43.5)
Worse	8 (9.5)	29 (46.8)	10 (43.5)
Fear/Anxiety[b]			
Better	38 (45.8)	28 (45.2)	6 (26.1)
Same	45 (54.2)	33 (53.2)	17 (73.9)
Worse	0 (0)	1 (1.6)	0 (0)
Speed/Duration			
Better	49 (58.3)	21 (33.9)	4 (17.4)
Same	34 (40.5)	29 (46.8)	15 (65.2)
Worse	1 (1.2)	12 (19.4)	4 (17.4)

[a] One participant in the "satisfied" group did not respond to any of the perception questions reported here.
[b] One participant in the "very satisfied" group did not respond to the "fear/anxiety" question. Therefore, no. (%) was calculated from a population of 83.

Table 11.
Perceptions of ID Injection vs IM Injection by Vaccine Administrators (n=8)

Topic	Responses, No.		
	Better Than IM	Same as IM	Worse Than IM
Vaccine Preparation	8	0	0
Ease of Administration	4	4	0
Time Required to Administer	6	2	0
Safety/Risk of Accidental Needle Stick for Administrator	7	1	0
Safety/Risk of Accidental Needle Stick for Patient	6	2	0

Abbreviations: ID, intradermal; IM, intramuscular.

Conclusion

The present study documented overall acceptability and satisfaction with the Fluzone ID vaccine in clinical practice by both patients and vaccine administrators. Additionally, our study is the first, to our knowledge, to document a patient preference for ID vaccine over IM vaccine in the United States. We believe that the popularity and the use of the ID mode of delivery will increase as patients and the medical community become more familiar with it. Further studies involving multiple centers and a larger sample size within the United States are recommended.

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