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Keywords: immunizations, advertisements, comics, healthcare communication

Abstract

Objectives: This study aimed at designing and assessing educational materials for adult immunizations through the medium of comics. The study design evaluated the effects of two vaccine information flyers (a CDC flyer vs a flyer designed in Comic medium) on participants' attitude towards the flyers. Methods: A between-group, randomized trial was used to compare the effectiveness of two vaccine information flyers on participants' attitude towards the flyers. Upon approval from the human subjects review committee, student participants (age ≥18 years) were randomly assigned either the CDC or comic flyer. They were then asked to respond to survey items developed to measure the flyers' effect on participants' attitude towards the flyer. Items were measured using a 7-point semantic differential scale. Cronbach's alpha was computed for reliability testing of the study instrument. Independent-samples t-test was used to compare means of the two groups with respect to their attitudes toward the flyer. Results: A total of 170 third-year pharmacy students participated in the study (N = 91 for Comic flyer & N = 79 for CDC flyer). There was a significant difference in attitudes toward the flyer between students who read comic flyers (mean = 6.14; SD = 0.62) and those who read CDC flyers (mean = 4.93; SD = 1.20). Additional comments provided by students further confirmed the quantitative findings of the study. Student responses to the use of comics as a medium of providing information on adult immunization were constructive and encouraging. Conclusion: The study findings showed that the flyer with comics was evaluated more attractive than the CDC flyer. The positive findings of our study could provide a new direction for developing educational materials about adult immunizations. Future research on comics, as a medium of communication, could explore its use as a tool for providing healthcare information to consumers.

Introduction

In the United States, a total of approximately 50,000-70,000 adults die each year of diseases potentially preventable by available vaccines.[1] Vaccination is a significant component of disease prevention particularly in the elderly. Adult immunizations are important because they not only reduce health consequences of vaccine-preventable diseases among adults, but also help to prevent the spread of certain diseases such as pertussis from adults to infants. However, according to the latest report by the Centers for Disease Control and Prevention (CDC), U.S. adult vaccination coverage remains "unacceptably low" for most routinely recommended vaccines, and falls well below the goals set by Healthy People 2020.[1] Also, with recent rising cases of flu and measles, substantial improvements in adult vaccination are needed.[2] For successful vaccination programs the Community Preventative Services Task Force recommends increasing access to vaccination services, implementing reminder-recall systems, and removing of financial barriers. Another recommendation includes the use of well-designed educational materials for informing adults about immunizations, in combination with the above mentioned strategies.[3]

Providing comprehensive, easily readable healthcare information in a format that encourages reading is an ongoing challenge. In the past, researchers have used both

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text and pictures in patient education materials to communicate complex and substantial amounts of information in a simplified manner.[4] A systematic review of literature on the use of text and pictures in health communication messages found that such combination approach attracts patients' attention to the message, facilitates comprehension of the message, influences their attitude towards the specific message in the health communication material and, influences intentions to act after reading the health communication message.[4] One of the most popular yet understudied and underutilized form of health communication media that combines visual images with text is – comics.

In recent times, health professionals and academicians have begun the use of comics in varied settings - from patient care settings, community education, to instructional purposes.[5-7] For example graphic pathographies - illness narratives in comics format - have emerged in the area of patient care.[5] Physicians have proposed that these graphic pathographies could help patients wanting to learn more about their illness and the experiences of similarly affected people in the community.[5] Recently, a renowned economist from the Massachusetts Institute of Technology (MIT) used the medium of comics to provide information about President Obama's healthcare reform.[6] Responses of pharmacy students to the use of comics as a supplemental reading in providing information of patient-centered care was overwhelmingly positive.[7]

However, despite the sporadic and anecdotal evidence of useful application of this approach, to the researchers' knowledge no empirical studies currently exist which evaluate the effectiveness of comics in providing information on adult immunizations. As a result, this was a randomized trial which primarily aimed at designing and assessing educational materials for adult immunizations through the medium of comics. The study compared the effects of two vaccine information flyers – the information flyer prepared by CDC and the flyer designed in comic format by the researchers of this study on participants' attitude towards the flyers.

Background

Comics as Medium of Communication

Comic books, often called "comics" for short, are diverse in content, genre, and appearance. Graphic novels i.e., comic books for adults, discuss more serious literature such as cancer, and depression. Comics have been defined as "juxtaposed pictorial and other images in deliberate sequence, intended to convey information and/or produce an aesthetic response in the viewer".[8] Although the word "comics" refers to the medium itself and not a specific object such as "comic books" or "comic strips", the two words (i.e., comics and comic books) are used interchangeably by individuals who use this medium or read these books.[8, 9] Nevertheless, comic books are colorful or black and white books filled with images and words (either typed or handwritten) in boxes or balloons and arranged in a sequence of panels, usually with a gap between the panels.[8-10] This medium appeals to a wider audience across all ages and ethnic groups because it employs an everyday language that is almost universally understood and concurrently instructive and entertaining.[8]

Use of the medium of comics in medicine is not a new phenomenon. Wright described how cartoons and comics have been used to communicate medical science over the past two centuries.[11] Delp and Jones evaluated the effect of cartoon illustrations on both patient comprehension of and compliance with ED release instructions.[12] They concluded that cartoon illustrations are an effective strategy for conveying information and may improve patient compliance with ED release instructions. Moll conducted three experiments which were aimed at deriving information about patients' reactions to visual material, both pictures and words.

He compared a reasonable range of pictures styles (illustrations, matchstick, cartoon, symbolic, and photograph) to unillustrated material to assess the value of pictures in providing healthcare information.[13] Moll found that in his study, exposure to illustrated booklets led to higher questionnaire scores than exposure to unillustrated booklets, but the difference was not statistically significant. Some styles of illustration were found to be more effective than others. Scores for the group that saw the booklet which included cartoons were higher. The 'matchstick' group was second and the 'photographic' group third.[13]

McAllister, in his paper titled *"Comic Books and AIDS"* contributed to the literature on the use of comics in medicine by discussing the involvement of comic books in providing information about AIDS.[14] He supported the use of comic books as a relevant medium for study by scholars interested in the sociology of AIDS. In the 1990s, the New York City Health Department developed a black and white comic strip series called *Decision* that followed characters dealing with HIV.[15] The strips initially appeared in subway cars, and were eventually compiled into a comic book handout. When the third issue invited readers to suggest the next events in the evolving story, the health department was swamped with suggestions. The Decision campaign is considered as one of the most successful efforts to raise awareness of issues surrounding HIV/AIDS. The New York City Comic Book

Museum recently featured Decision in its World AIDS Day exhibit and documentary, Comic Books and AIDS: What's the Story? Additionally, Decision is part of the Smithsonian Institution's permanent collection.[15, 37]

The National Kidney Foundation used graphic novels to educate patients about the challenges of dialysis.[16] In 2007, the National Kidney Foundation developed a graphic novella called "*Hope and Main*" for the dialysis community. *Hope and Main* was funded by a pharmaceutical company through a non-restricted educational grant.[16] The primary goal was to use the medium of comics to educate patients about dialysis issues.

Although these examples in the literature highlight the use of comics as an effective tool to provide healthcare information, there is a dearth of empirical studies which evaluate the effectiveness of comics in providing healthcare information, especially on participant's feelings on the use of comics as a medium to provide information regarding adult immunizations. As a result, this study aimed at designing and assessing educational materials for adult immunizations through the medium of comics.

Effects of Advertisements on Consumers Attitude towards the Advertisement

According to anecdotal reports, DARE - the anti-drug education program, has failed to substantially reduce drug use among peers.[17] This failure serves as on an example of how advertising expenditures could be wasted in ineffective campaigns.[18, 19] Advertisers usually concern themselves with the advertisements' influence over consumers. Prior research in advertising has focused on affective responses provided by participants who view the advertisement.[20-22] Affective effects of advertising are measured through the influence on consumer attitude towards an advertisement.[23] A participant's attitude towards an advertisment is a predisposition to respond in a favorable or unfavorable manner to a particular advertismenting stimulus during a particular exposure situation.[23, 24] According to this measure, consumers form their preferences on the basis of elements such as liking, feelings, and emotions induced by an exposure to the advertisement.[25, 26] The initial attitude towards the advertisement is important because it affects the consumer's intentions of further viewing the advertisement which sequentially influences the consumer's cognitive processes, attitude towards the brand, and purchase intentions.[27] In this study, attitude towards the advertisement was operationalized as attitude towards the patient education material for adult immunization. This term was defined as the participants' predisposition to respond in a favorable or unfavorable manner to the patient education material. It was measured on a 7-point semantic differential scale.[28]

Methods

The study objective was to compare the effects of two vaccine information flyers – the information flyer prepared by CDC and the flyer designed in comic format in this study

Study Design

The study employed a between-group, randomized trial comparing the effectiveness of two vaccine information flyers on participant's attitudes. The researcher selected a between-group design to prevent testing effect, which is a threat to internal validity.[29] In a between-groups design each participant participates in one and only one group.[29]

Study Intervention

The study intervention was a one-page vaccine information flyer providing information about adult immunizations. One of the flyers titled, *"Do You Know Which Adult Vaccines You Might Need?"* is an educational flyer developed by the Centers for Disease Control and Prevention (CDC) to inform and educate adults about immunizations.[30] The CDC flyer provides an overview of vaccines recommended for adults based on age, health conditions, and other factors, and are designed to motivate adults to learn more about the vaccines they need and get vaccinated. Information (text) from this CDC flyer was adapted to design a one-page adult vaccine information flyer in the comic medium (Figure 1a and 1b). A hired illustrator created the education material in the comic medium (Figure 1a and 1b). University clinical pharmacy practice faculty proof-read the patient education material prepared in the comic medium.

Study Sample

A convenience sampling methodology was adopted for participant recruitment. Study participants were students (age ≥18 years) enrolled in a University located in the Northeast region of the country. Student participants were included because, as per the researcher's knowledge, this is the first study that examined the use of comics as a medium in providing information on adult immunizations. Since this research involved exploring the new medium, it was tested using student participants before application to a general consumer population.[31] Also, this sample of adults could be considered as a representative of the population, which is perceived as being a natural target for these types of educational materials on adult immunizations. The minimal sample size needed in the study was 158 total number of participants (79 participants per group) [(Anticipated Effect Size = 0.45; Desired Power = 0.80; Alpha value = 0.05)].[32]

Data Collection

Prior studies incorporating measures of attitude toward advertisements have used bipolar adjective (semantic differential) item-pairs.[20, 33] For this research six 7-point semantic differential scales (pleasant/unpleasant; good/bad; appealing/unappealing; comfortable/uncomfortable; eye-catching/not eye-catching) were used to elicit participants' attitude towards the patient education flyers. Upon approval from the human subjects review committee at the University, a research assistant who was also a trained pharmacy student collected the data for this study.

At this University, pharmacy courses are taught in sections. Back-to-back sections of a Pharmacy Management course for third year pharmacy students were randomly selected for the study. Permission to conduct the study was sought from the faculty teaching the respective sections. The research assistant went to the respective sections, introduced himself, and explained the voluntary nature of the study. Each section was randomly assigned to either the CDC vaccine information flyer or the comic format vaccine information flyer. In addition to the study intervention flyer, a cover letter stating the purpose and voluntary nature of this study, and the study questionnaire, was handed to each student participant. Reading the flyer and answering the survey took approximately 10-minutes. Completed questionnaires were collected immediately by the research assistant. Participants who completed the survey were asked to provide their name/email, on a separate sheet of paper, to be considered for a lucky drawing as an incentive for their participation.

Data Analysis

Data were analyzed using Statistical Package for Social Sciences (SPSS version 21.0). Prior to data analysis, we tested the reliability and validity of the items used to assess participants' attitude towards the flyer. Face validity was judged and achieved with the help of colleagues and faculty members who were familiar with the research aspects of attitude toward advertisements. Construct validity was measured using factor analysis. The factor analysis was based on principal component analysis. The internal consistency of measures was tested using Cronbach's alpha. A Cronbach's alpha of 0.70 or higher was considered as an acceptable reliability coefficient. Based on the responses provided by the participants, a summated score for the construct of attitude towards the flyer was created and from this an average score was calculated. This mean score was used as participants' response to the overall construct of "attitude towards the flyer". Independent-samples t-test was used to compare means of the two groups to address the stated research objective.

Results

Table-1 provides a summary of the six items we used to measure the variable "attitude towards the flyer". The table shows that all six items in this study met the factor analysis criteria (exhibited a factor loading with an absolute value greater than 0.50).[34] The Cronbach's alpha value of the six measurement items was 0.87. The six items listed in table # 1 were used for final analysis.

A total of 170 pharmacy students (third professional year) participated in this study (N = 91 for comic flyer vs N = 79 for CDC flyer). Overall, the effect of flyer style (comic vs CDC) on participant's attitude towards the flyer was statistically significant ($t = 8.37$; $df = 168$; $p<0.0002$). The mean scores for attitude towards the flyer reported by participants exposed to comic flyer (Mean = 6.14, SD = 0.62) were significantly higher than the mean scores for attitude towards the flyer reported by participants who viewed the CDC flyer (Mean = 4.93; SD = 1.20) (Table # 2a and 2b). Student responses to the use of comics as a medium of providing information on adult immunizations were also very constructive and encouraging (Table # 3). Students who viewed the comic flyer described it as "*colorful, eye-catchy, attention grabber, informative, and easy to read*". At the same time study participants felt that some of the cartoons and colors used in the comic flyer were a little childish – "*The information was good and the colors very eye catching. I liked most of it but, some of the cartoons were a little childish.*" Participants who viewed the CDC flyer thought that the flyer was not eye-catching enough and needed more visuals in presenting the information – "*It should have been more colorful and bright so it is appealing.*"; "*Needs more visuals in representing data.*"

Discussion

The Centers for Disease Control and Prevention (CDC) estimates that 90 percent of flu-related deaths occur in people 65 years of age and older, and their recommended protocol encourages all senior citizens get their annual flu shots.[1, 35-36] As the country moves towards ways of improving immunization rates, educational programs will become the focus for public officials who would want to improve vaccination rates among adults.[2, 35-36] The overall purpose of this study was to explore new ways of providing information about adult immunizations.

In the past, researchers have used visuals and text in providing healthcare information.[4, 20] The current study evaluated the medium of comics, which includes visuals and text in a narrative form, to provide information on adult immunizations. An adult immunization flyer designed in a comic format was compared with the CDC flyer for adult immunizations. The overall study findings supported the use

of comics as a medium of providing information about adult immunizations. Participants displayed a favorable attitude towards the flyer designed in comic format versus the CDC flyer. These findings affirmed the evidence in previous literature which suggests participants favored the use of cartoons in providing healthcare information as compared to healthcare information without illustrations.[12, 13]

The CDC flyer (figure #1a) did include visuals but these visuals were real-life photographs. Still, comics emerged as the favorable style of presenting information. These findings confirmed the findings of the Moll study which compared a range of styles of pictures (illustrations, matchstick, cartoon, symbolic, and photograph) to provide healthcare information and found scores for the group that saw the information in cartoon format were higher followed by the 'matchstick' group and the 'photographic' group.[13] This may be because of the "abstract" nature of visuals in comics.[8] The level of abstractness of the visuals varies between "real-life" pictures to cartoon images. In general, the uniqueness of the visuals in comics is that even though images get abstract through cartooning, the meaning of the textual information that is presented still remains the same.[8] Through reducing the specificity of the pictures, the comics become more relatable and generalized. At the same time it could be argued that comics as a medium of providing healthcare information might work in the opposite direction i.e., it might generate annoyance among patients who might interpret comics as being inappropriate in the healthcare field that is far from humorous. This may be a reason for very little research being done in the area of using comics as a medium to present the health information. Further research in this area is needed.

Study Limitations

As per the researchers' knowledge this is the first study that evaluated the use of comics as a medium of providing information on adult immunizations. However, the positive findings of this study should be interpreted with the following limitations in mind. First, although the study participants were adults (18 years and older), a convenience sample of university students considered for this study limits the generalizability of the study findings to real-world situations. Student participants could be considered more knowledgeable about preventive behavior and might respond differently to healthcare information. Second, the study measured only participants' attitude towards the flyer, which is another limitation. It did not measure the informativeness of the content or participants intentions upon seeing the flyer. Healthcare messages are designed to provide information to consumers and designed to influence consumer health behavior. Future research could measure the cognitive and behavioral influence of the information presented in a comic format. Third, although it did not significantly influence the study objective, we did not ask gender as a question. As a result, gender differences in responses were difficult to measure.

Conclusion

Healthcare agencies such as the CDC are involved in developing educational materials to effectively communicate important health issues to help people lead healthier lives in healthier communities. The study findings showed that the flyer with comics was more attractive than the CDC flyer. Comics, as a medium of communication, could be explored as a tool for providing disease and treatment information to consumers and patients.

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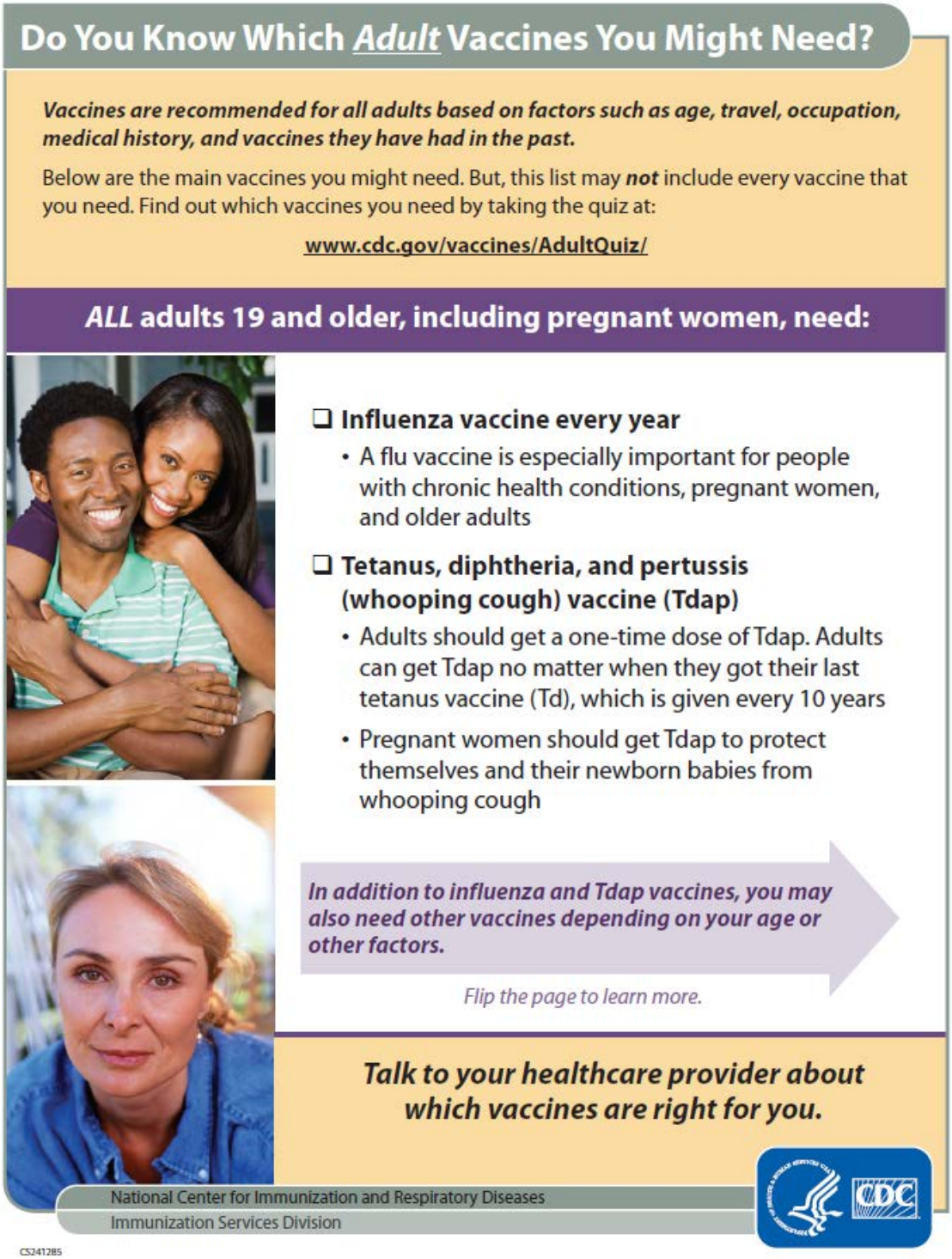
Figure 1a: Centers for Disease Control and Prevention (CDC) Patient Education Flyer for Adult Immunization
"Do You Know Which Adult Vaccines You Might Need?"



Do You Know Which *Adult* Vaccines You Might Need?

Vaccines are recommended for all adults based on factors such as age, travel, occupation, medical history, and vaccines they have had in the past.

Below are the main vaccines you might need. But, this list may ***not*** include every vaccine that you need. Find out which vaccines you need by taking the quiz at:

www.cdc.gov/vaccines/AdultQuiz/

ALL adults 19 and older, including pregnant women, need:

Figure 1b: Patient Education Flyer for Adult Immunization in Comic Format

"Do You Know Which Adult Vaccines You Might Need?"

Table 1: Factor Analysis Results for Study Survey (N = 170)

Factor: Attitude towards the flyer

Items	Factor Loading
Pleasant/Unpleasant	0.785
Good/Bad	0.816
Interesting/Boring	0.823
Appealing/Unappealing	0.821
Comfortable/Uncomfortable	0.671
Eye-catching/Non Eye-catching	0.781

Table 2: Independent Sample t-test Comparing the Two Groups (CDC vs Comic) (N=170)

Table 2a: Descriptives				
	Groups	N	Mean	Std. Deviation
Attitude towards flyer	Comic	91	6.14	0.62
	CDC	79	4.93	1.20

		Table 2b: t-test for Equality of Means						
							95% Confidence Interval of the Difference	
		t	df	p-value	Mean Difference	Std. Error Difference	Lower	Upper
Attitude towards the flyer	Equal variances assumed	8.37	168	0.0002	1.20	0.144	0.92	1.49
	Equal variances not assumed	8.03	112.86	0.0001	1.20	0.149	0.91	1.50

Table 3: Selected Additional Comments Provided by Study Participants

#	Student Responses to Comic Flyer	Student Responses to CDC Flyer
1	It is an easy read. The flyer is appealing to all ages. Bright and colorful – attention grabbing.	Colors are not appealing.
2	I thought it was very catchy. Very colorful attention grabber but, would like a little bit more information	I would not pick it up unless it was physically handed to me.
3	I thought it was very catchy but I would like something a little bit more informative. Overall, it was very good. I think for general public it will be very good. Great graphics – easily understandable!	Good flyer for a quick informative read.
4	Love the graphics; information was easy to understand; very eye-catching – overall excellent flyer.	The flyer was not eye-catching. Needs more visuals in representing data.
5	The visuals were great. The cartoon was great but perhaps use less words/condense the material somewhat.	I never got a flu shot before and seeing this flyer probably wouldn't have convinced me to receive the shot.
6	The information was good and the colors very eye catching. I liked most of it but, some of the cartoons were a little childish. I know it had to be understandable but it made me a little uncomfortable as it made it seem like I was too dumb to understand the importance of immunizations.	It should have been more colorful and bright so it is appealing.
7	Great idea! Also, may be consider removing the graphic of the syringe since that is what scares a lot of people about vaccines.	It was too wordy for the amount of information given. Also, information looked very repetitive. Information was not easy to understand.
8	Very easy to understand. Also, a comic is a good format to present information. The needle in the first picture is a little daunting. Overall, great job!	Some of the bullet points may be shortened. Use different colors.
9	Headline isn't large enough. At first glance it is difficult to quickly understand that it is about vaccines.	It was a very generic flyer. Information should be provided in an efficient manner.
10	Simple information, beautiful artwork, eye-catching especially in a doctor's office or pharmacy	It utilizes unnecessary lengthy descriptions that essentially provide very little useful information in so far as the importance of the vaccinations.
11	It needs more information to be for adults. It's eye-catching and I like the drawings, however, the personification of some inanimate objects is child-like as well.	Some of this information is difficult for normal individuals to understand.
12	This flyer is supposed to be catered towards adults but from the appearance it seems more targeted for children. The colors are vibrant and eye catching which is good but the context is lacking. Include more information about why adults should get vaccines, what are the risks if they don't get it etc.	Nice flyer that gives patients essential information and doesn't overwhelm the reader to the point that they lose interest.
13	It is very eye-catching which makes me want to read the comic. It is also a quick read which makes it more likely for people to read.	Flyer is very well made.
14	The bright colors definitely make this flyer something I would want to glance at the very least. I like how info about the most pertinent vaccine is concise. It is not information overload and all ages will find it easy to read and understand. Including a website was a nice idea. People can look for more information. The only change I would make is to decrease the size of the text in boxes.	Why does an adult need to be vaccinated?