LETTER TO THE EDITOR

New approach for promoting HPV vaccination in college men based on multi-theory model (MTM) of health behavior change

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Dear Editor,

Human papilloma virus (HPV) is among the most common infections in college-aged men [1]. In men, it causes genital warts and several cancers that include penile, anal, and oropharyngeal carcinomas [2]. To prevent genital warts and HPV-related cancers, HPV vaccination has been recommended by the Advisory Committee on Immunization Practices for young adult males since 2011 [3]. College students are a salient target population for HPV vaccination surveillance and promotional activities because they are at an increased risk for HPV infection and also represent a priority group for HPV catch-up vaccinations [4]. Furthermore, about 48% young adults ages 18 to 24 have been enrolled in or have completed college between 2013 and 2015 [5]. However the rates of HPV vaccination in college males has been quite low and was recorded as 42.9% in 2013 with the odds of HPV vaccination being 2.97 (95% CI 2.48-3.55) [4]. While the rates for HPV vaccination in the ages 18-21 years were 49.5% the rates in ages 22 -26 years were only 28.6% [4]. These rates were far lower than in women. Hence, there is a need to design and evaluate HPV vaccine promotion interventions for college men.

Very few interventional studies have been undertaken to assess the efficacy of educational interventions to promote HPV vaccination in college men. One such study was undertaken by the researcher in 2013 that utilized health belief model (HBM) [6, 7]. Using a randomized controlled trial, HBM-based intervention was compared with a traditional knowledge-based intervention in college-aged men ages 18-25 years. Repeated measures ANOVA demonstrated significant positive changes in the HBM-based group for knowledge and HBM constructs. Pretest/posttest regression analysis found that self-efficacy for taking the vaccine ($p < 0.001$), perceived barriers ($p = 0.007$), and perceived severity ($p = 0.004$) were significant positive predictors of vaccine acceptability. The model had an adjusted R^2 of 0.351. However, the actual rates of HPV vaccination were not measured in this study. Also this study did not apply this approach for effectiveness testing.

HBM is an old theory and a newer theory has been proposed that is the multi-theory model (MTM) of health behavior change that is parsimonious, utilizes proven constructs from multiple theories, is culturally robust and can be used to design interventions at individual, group and community levels [8, 9]. This theory breaks the behavior change into initiation and sustenance. The theory proposes that participatory dialogue in which advantages outweigh disadvantages, behavioral confidence and changes in physical environment are crucial for health behavior change. For sustenance of behavior change the constructs of practice for change, emotional transformation and changes in social environment are important. The theory is new and in its initial applications to physical activity behavior in adults [10], portion size behavior in adults [11], and sleep behavior [12] has shown very good predictability. Hence, we propose that this theory be utilized for designing and evaluating the efficacy and effectiveness of brief MTM-based interventions to promote HPV vaccination in college men. The studies can utilize randomized controlled trials (RCTs) in which the independent variables will be the experimental MTM-based interventions which can be compared against knowledge-based interventions. The dependent variables can be the constructs of MTM, intent for vaccinations and actual vaccinations received. An instrument for quantitative study is attached in the Appendix 1.

The experimental MTM-based intervention can consist of two-sessions of 60 minutes each. The first session can entail administration of baseline instrument and activities to influence initiation of behavior of acquiring HPV vaccination. These can include a large group participatory dialogue on advantages and disadvantages of HPV vaccination in which the advantages would outweigh disadvantages. In order to build behavioral confidence, the steps for getting HPV vaccination and overcoming barriers in acquiring this vaccination can be underscored through a lecture and role play. In order to influence physical environment, the sites for getting this vaccination and support in getting HPV vaccination can be underscored through a lecture, group discussion, and provision of incentives. The second session after one week of the first session can aim at influencing sustenance of behavior of completing three doses of HPV vaccination. In order to influence the construct of practice for change the participants can be provided a check sheet and explained how to maintain it. Ways to overcome barriers in completing the schedule and adjusting one's routine can

also be discussed during the session. In order to influence the construct of emotional transformation ways to direct one's emotions/feelings to the goal of getting all three doses of the HPV vaccination, ways for self-motivation and ways for overcoming self-doubt can be discussed. Finally, in order to influence changes in social environment, ways to enlist social support from friends, family and researcher can be discussed. Data can be collected post intervention for intent of getting vaccinated and after six months for actual vaccination rates.

The control knowledge-based intervention can also consist of two equivalent sessions of 60 minutes each. The first session can entail administration of baseline instrument and lectures on overview of sexually transmitted diseases, signs and symptoms of sexually transmitted diseases, HPV, consequences of HPV, significance of HPV, transmission of HPV, and prevention of HPV. The second session after one week of the first session can include lectures on history of vaccines, common vaccines, and HPV vaccine and will collect data through the 41-item instrument for the second time (at the conclusion of the intervention). We implore practitioners and researchers in HPV prevention to design and evaluate such efficacy and effectiveness trials

Acknowledgments

Authors' contributions

MS conceptualized the letter and developed the instrument. VKN provided suggestions and is the corresponding author.

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Appendix 1

Measuring Change in HPV Vaccination Behavior   Code # _____

Directions: This survey is voluntary, which means you may choose not to complete it or not to answer individual questions. There is no direct benefit of this survey to you; however your responses will help in developing effective human papillomavirus (HPV) vaccination programs. All data from this survey will be confidential. Please put an X mark by the response or fill the response that correctly describes your position. Thank you for your help!

- Are you a male? [Screening question]
  ☐ Yes
  ☐ No

If respondent selects no, she will not be enrolled.

- Are you between the age of 18 and 26 years? [Screening question]
  ☐ Yes
  ☐ No

If respondent selects no, he will not be enrolled.

- Do you suffer from any medical condition that prevents you from getting vaccinations? [Screening question]
  ☐ Yes
  ☐ No

If respondent selects yes, he will not be enrolled.

- How many doses (shots) of the human papillomavirus (HPV) vaccine have you received? [Screening question]
  ☐ 0
  ☐ 1
  ☐ 2
  ☐ 3

If respondent selects, "1, 2, or 3", they will receive the following message, "You have initiated taking HPV vaccine; therefore, you do not qualify for this study. Thank you for your time!"

1. How old are you today?   _____ years

2. What is your race/ethnicity?   ☐ White or Caucasian
                                       ☐ Black or African American
                                       ☐ Asian or Pacific Islander
                                       ☐ American Indian, Alaskan Native, or Native Hawaiian
                                       ☐ Biracial or Multiracial
                                       ☐ Hispanic or Latino
                                       ☐ Other _____

3. What is your current overall GPA?   ☐ Less than 1.99
                                       ☐ 2.00 – 2.49
                                       ☐ 2.50 – 2.99
                                       ☐ 3.00 – 3.49
                                       ☐ 3.50 – 4.00

4. What is your year in school?
    ☐ 1st year undergraduate
    ☐ 2nd year undergraduate
    ☐ 3rd year undergraduate
    ☐ 4th year undergraduate
    ☐ 5th year or more undergraduate
    ☐ Graduate or professional
    ☐ Not seeking a degree
    ☐ Other

5. Where do you live?
    ☐ On campus
    ☐ Off-campus

6. Do you work?
    ☐ No
    ☐ Yes, _____ hours/week (put a single number not a range)

7. What is your primary source of health insurance?
    ☐ My college/university sponsored plan
    ☐ My parents' plan
    ☐ Another plan
    ☐ I don't have health insurance

8. Prior to being asked to participate in this study, had you ever heard of human papillomavirus (HPV)?
    ☐ Yes
    ☐ No

9. Prior to being asked to participate in this study, had you ever heard of the vaccine for human papillomavirus (HPV)?
    ☐ Yes
    ☐ No

10. What is your relationship status?
    ☐ Not in a relationship
    ☐ In a relationship but not living together
    ☐ In a relationship and living together

11. What is your marital status?
    ☐ Single, never married
    ☐ Married
    ☐ Separated
    ☐ Divorced
    ☐ Widower

Please rate the following items by placing a [X]

	Never	Hardly ever	Sometimes	Almost always	Always

Participatory dialogue: Advantages

If you get the HPV vaccination you will…

	Never	Hardly ever	Sometimes	Almost always	Always
12. … be protected against genital warts.	☐	☐	☐	☐	☐
13. … be protected against cervical cancer (females) or anal cancer (males).	☐	☐	☐	☐	☐
14. …improve your sexual health.	☐	☐	☐	☐	☐
15. …feel better about yourself.	☐	☐	☐	☐	☐
16. …feel less stress.	☐	☐	☐	☐	☐

....   NEW APPROACH FOR PROMOTING HPV VACCINATION IN COLLEGE MEN
BASED ON MULTI-THEORY MODEL (MTM) OF HEALTH BEHAVIOR CHANGE

	Never	Hardly ever	Sometimes	Almost always	Always

Participatory Dialogue: Disadvantages

If you get HPV vaccination you will…

	Never	Hardly ever	Sometimes	Almost always	Always
17. … have side effects.	☐	☐	☐	☐	☐
18. … not have enough money to pay for it. (cost is around $150 for each dose)	☐	☐	☐	☐	☐
19. … be inconvenienced.	☐	☐	☐	☐	☐

Participatory Dialogue: Disadvantages

If you get HPV vaccination you will…

	Never	Hardly ever	Sometimes	Almost always	Always
20. … suffer from adverse effects.	☐	☐	☐	☐	☐
21. … have a false sense of protection against all sexually transmitted diseases (STDs).	☐	☐	☐	☐	☐

Behavioral confidence

**How sure are you that you will
get the first dose of the HPV vaccine …**

	Not at all sure	Slightly sure	Moderately sure	Very sure	Completely sure
22. … in the near future?	☐	☐	☐	☐	☐
23. … in the near future without insurance (cost is around $150 for each dose)?	☐	☐	☐	☐	☐
24. … in the near future with your present schedule?	☐	☐	☐	☐	☐
25. … in the near future even if it is offered at a large distance from your home?	☐	☐	☐	☐	☐
26. … in the near future even if it causes side effects?	☐	☐	☐	☐	☐

E207   ....

	Not at all sure	Slightly sure	Moderately sure	Very sure	Completely sure

Changes in physical environment

How sure are you that you will…

	Not at all sure	Slightly sure	Moderately sure	Very sure	Completely sure
27. … be able to arrange payment for the first dose of the HPV vaccination?	☐	☐	☐	☐	☐
28. … be able to arrange a place to get the first dose of the HPV vaccination?	☐	☐	☐	☐	☐
29. … be able to arrange transportation to get the first dose of the HPV vaccination?	☐	☐	☐	☐	☐

	Not at all sure	Slightly sure	Moderately sure	Very sure	Completely sure

Emotional transformation

How sure are you that you can…

	Not at all sure	Slightly sure	Moderately sure	Very sure	Completely sure
30. … direct your emotions/feelings to the goal of getting all three doses of the HPV vaccination?	☐	☐	☐	☐	☐
31. … motivate yourself to get all three doses of HPV vaccination?	☐	☐	☐	☐	☐
32. … overcome self-doubt in accomplishing the goal of getting all three doses of HPV vaccination?	☐	☐	☐	☐	☐

	Not at all sure	Slightly sure	Moderately sure	Very sure	Completely sure

Practice for change

How sure are you that you can…

	Not at all sure	Slightly sure	Moderately sure	Very sure	Completely sure
33. … keep a record to monitor getting three doses of the HPV vaccination?	☐	☐	☐	☐	☐
34. … get three doses of HPV vaccination even if you encounter barriers?	☐	☐	☐	☐	☐

	Not at all sure	Slightly sure	Moderately sure	Very sure	Completely sure
35. … change your schedule to get three doses of HPV vaccination if you face difficulties?	☐	☐	☐	☐	☐

	Not at all sure	Slightly sure	Moderately sure	Very sure	Completely sure

Changes in social environment

How sure are you that you can get the help of a…

	Not at all sure	Slightly sure	Moderately sure	Very sure	Completely sure
36. … family member to support you with getting three doses of the HPV vaccination in the next 12 months?	☐	☐	☐	☐	☐
37. …friend to support you with getting three doses of HPV vaccination in the next 12 months?	☐	☐	☐	☐	☐
38. … health professional to support you with getting three doses of HPV vaccination in the next 12 months?	☐	☐	☐	☐	☐

	Not at all likely	Somewhat likeky	Moderately likely	Very likely	Completely likely

Behavior change: Initiation

How likely is it that you will…

	Not at all likely	Somewhat likeky	Moderately likely	Very likely	Completely likely
39. … get the first dose of the HPV vaccination in the next month.	☐	☐	☐	☐	☐

	Somewhat all likely	Moderately likeky	Very likely	Completely likely	likely

Behavior change: Sustenance

How likely is it that you will…

	Somewhat all likely	Moderately likeky	Very likely	Completely likely	likely
40. … complete all three doses of HPV vaccination within the next 12 months.	☐	☐	☐	☐	☐

Thank you for your time!

SCORING

Construct of advantages: Scale: Never (0), Hardly ever (1), Sometimes (2), Almost always (3), Always (4). Summative score of Items 13-17. Possible range: 0- 20. High score associated with likelihood of initiation of behavior change.

Construct of disadvantages: Scale: Never (0), Hardly ever (1), Sometimes (2), Almost always (3), Always (4). Summative score of Items 18-22. Possible range: 0- 20. Low score associated with likelihood of initiation of behavior change.

Subtract disadvantages score from advantages score to calculate **participatory dialogue** construct score. Positive score will be indicative of initiation of behavior change.

Construct of behavioral confidence: Scale: Not at all sure (0), slightly sure (1), moderately sure (2), very sure (3), completely sure (4). Summative score of Items 23-27. Possible range 0-20. High score associated with likelihood of initiation of behavior change.

Construct of changes in physical environment: Scale: Not at all sure (0), slightly sure (1), moderately sure (2), very sure (3), completely sure (4). Summative score of Items 28-30. Possible range 0-12. High score associated with likelihood of initiation of behavior change.

Construct of emotional transformation: Scale: Not at all sure (0), slightly sure (1), moderately sure (2), very sure (3), completely sure (4). Summative score of Items 31-33. Possible range 0-12. High score associated with likelihood of sustenance of behavior change.

Construct of practice for change: Scale: Not at all sure (0), slightly sure (1), moderately sure (2), very sure (3), completely sure (4). Summative score of Items 34-36. Possible range 0-12. High score associated with likelihood of sustenance of behavior change.

Construct of changes in social environment: Scale: Not at all sure (0), slightly sure (1), moderately sure (2), very sure (3), completely sure (4). Summative score of Items 37-39. Possible range 0-12. High score associated with likelihood of sustenance of behavior change.

For **modeling initiation** dependent variable can be Item 40: not at all likely (0), somewhat likely (1), moderately likely (2), very likely (3), and completely likely (4) and multiple regression can be used. For **modeling sustenance** dependent variable can be Item 41: not at all likely (0), somewhat likely (1), moderately likely (2), very likely (3), and completely likely (4) and multiple regression can be used.

Flesch Reading Ease 68
Flesch-Kincaid Grade Level 5.5