Teaching Clinical Problem Solving in a Nonprescription Medication Course with Treatment Algorithms

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Two methods of teaching, treatment algorithms versus traditional format (lecture with case study integration) were compared to determine if there was: (*i*) a change in student test scores, and (*ii*) change in student ratings of the course. The sample consisted of 125 third year entry-level pharmacy students enrolled in a Nonprescription Medicines class. Different aspects of first aid and common cold were taught using the two different methods. Treatment algorithms were employed for the first aid topics of abrasions, heat injuries, and broken bones. Algorithms were also used to teach the role of antihistamines in the management of the common cold. The traditional format was employed for the first aid topics of bleeding, nosebleeds, and insect stings. The traditional format was also used to teach the role of decongestants in the management of the common cold. Student learning was measured via pre- and posttest questions. The number of students whose score improved from pre- to posttest on a topic was recorded. Additionally, examination test scores as well as student ratings from two classes were compared. The results demonstrated there were no significant differences between teaching methods in the area of first aid and the common cold. However, improved examination scores as well as student evaluations of the course were associated with use of algorithms. Treatment algorithms are a different approach to classroom teaching and in some instances may enhance learning in some areas of nonprescription drug therapy.

INTRODUCTION

The Nonprescription Products course is required during the fall semester for approximately 125 third-year entry-level pharmacy students. The focus is placed on assessment of the patient and in making product recommendations. The course is designed to be practical so students are able to leave the classroom and immediately use what they have learned in a practice setting.

A barrier that has become more obvious each year is the increasing amount of new material that must be incorporated into the learning experience. This is compounded in that students generally feel a great amount of information is already covered at a rapid pace. Additionally, as more products make the shift from legend status to the over the counter (OTC) market, more focus will be placed on self care. With these concerns in mind, a new approach to teaching was investigated. To assist the student in problem solving and in making product recom-
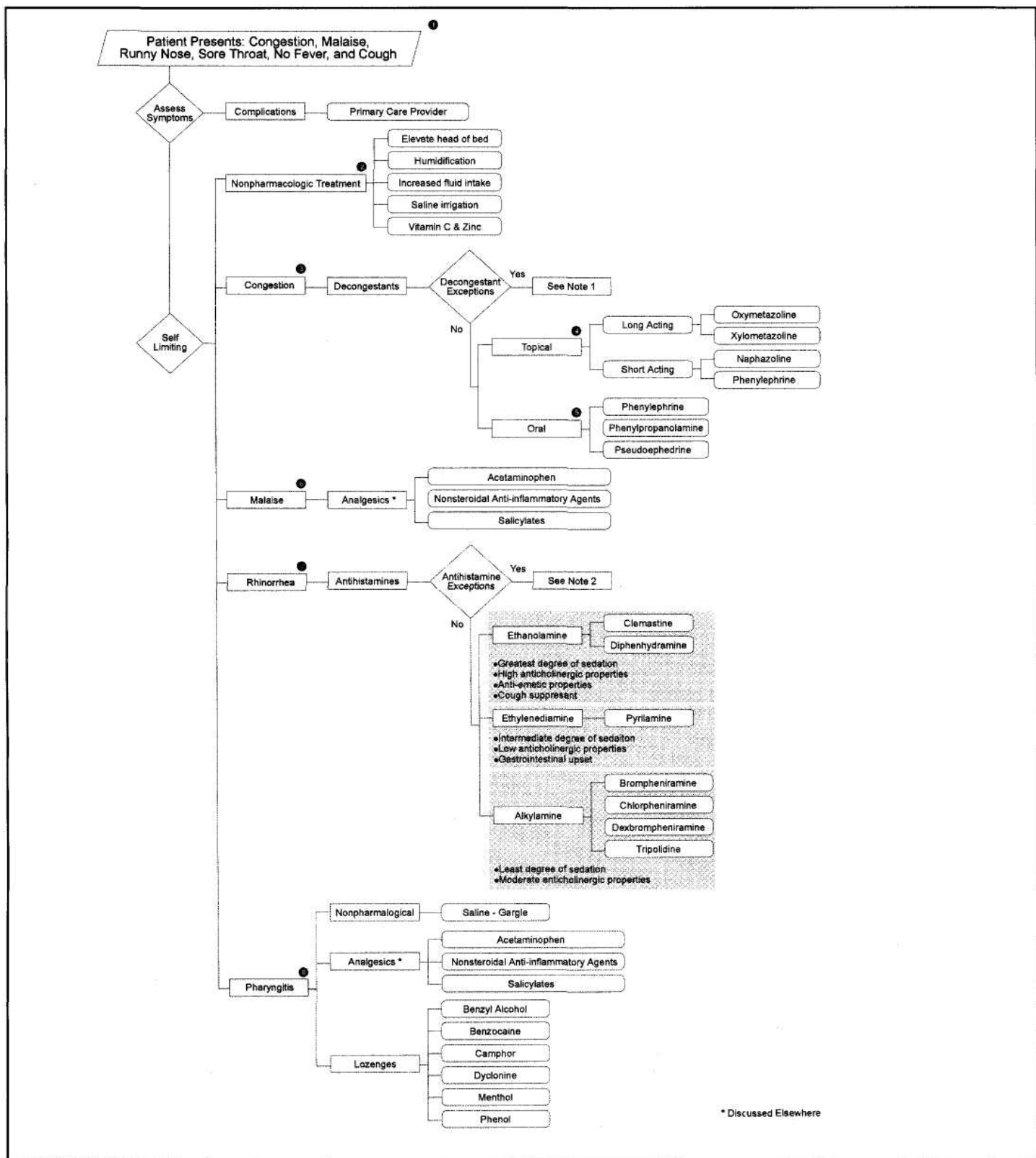
mendations treatment algorithms were introduced into the Nonprescription Products course. Patient management with the use of treatment algorithms has been used in the past(1-6).

GOALS

Treatment algorithms were introduced into a Nonprescription Products course and compared to a traditional lecture with case study presentation to determine if this was associated with: (*i*) a change in student test scores; (*ii*) a change in student ratings of the course. It was hypothesized when using treatment algorithms to help problem solve students would find the method to be a good instructional resource.

DESCRIPTION OF TEACHING METHODS

Traditional lecture format with case study integration has been the teaching framework used in the Nonprescription Products

Fig. 1. Self-care of the common cold.

Patient Presents: Congestion, Malaise, Runny Nose, Sore Throat, No Fever, and Cough ❶

Assess Symptoms → Complications → Primary Care Provider

Nonpharmacologic Treatment ❷
- Elevate head of bed
- Humidification
- Increased fluid intake
- Saline irrigation
- Vitamin C & Zinc

Self Limiting

Congestion ❸ → Decongestants → Decongestant Exceptions → Yes → See Note 1
- No → Topical ❹ → Long Acting → Oxymetazoline / Xylometazoline
- Short Acting → Naphazoline / Phenylephrine
- Oral ❺ → Phenylephrine / Phenylpropanolamine / Pseudoephedrine

Malaise ❻ → Analgesics *
- Acetaminophen
- Nonsteroidal Anti-inflammatory Agents
- Salicylates

Rhinorrhea ❼ → Antihistamines → Antihistamine Exceptions → Yes → See Note 2
- No → Ethanolamine → Clemastine / Diphenhydramine
  - •Greatest degree of sedation
  - •High anticholinergic properties
  - •Anti-emetic properties
  - •Cough suppressant
- Ethylenediamine → Pyrilamine
  - •Intermediate degree of sedaiton
  - •Low anticholinergic properties
  - •Gastrointestinal upset
- Alkylamine → Brompheniramine / Chlorpheniramine / Dexbrompheniramine / Tripolidine
  - •Least degree of sedation
  - •Moderate anticholinergic properties

Pharyngitis ❽
- Nonpharmalogical → Saline - Gargle
- Analgesics * → Acetaminophen / Nonsteroidal Anti-inflammatory Agents / Salicylates
- Lozenges → Benzyl Alcohol / Benzocaine / Camphor / Dyclonine / Menthol / Phenol

* Discussed Elsewhere

course for the past several years. The course is a three hour semester team taught course which is lead by Pharmacy Practice faculty who have practice interests in Ambulatory Care, Geriatrics, Community Pharmacy, and Pediatrics. Students are given a comprehensive syllabus containing objectives for all of the topics and a schedule on the first day of class. Case studies, outlines, additional methods, and in some instances copies of slides are usually distributed on the specific class day. The textbook used is the Handbook of Nonprescription Drugs distributed by the American Pharmaceutical Association(7). The traditional format includes a didactic lecture and case study accompanied by discussion. In the past, this type of instruction has been rated by the students on their evaluations of the course as good (student evaluations

of the course overall in 1996 were ranked 4.1 on a five-point scale). However, there may be a better way in some areas to assist students in problem solving and enhance learning.

METHODS

A new approach using treatment algorithms was implemented during the fall of 1997 in selected topic areas. The selected topic areas were taught by one of the course instructors. The algorithm approach centered on discussion using decision pathways and was used for the following topics: (*i*) First Aid: abrasions, heat injuries, and broken bones; and (*ii*) Common cold: role of antihistamines. See Figure 1 for example of algorithm on Self-Care of the Common Cold. The final version of the algorithm is published elsewhere(8). The traditional format was used for the following topics: (*i*) First Aid: bleeding, nosebleeds, and insect stings; and (*ii*) Common cold: role of decongestants.

A comparison of the two teaching methods (traditional vs. algorithm) was conducted using chi square (significance was set at *P*<0.05). Student learning was measured for each of the topic areas via pre- and posttest questions. The number of students whose scores improved from pre-to posttest on a topic was determined. Between group (traditional vs. algorithm) comparisons were then made using chi square.

An objective examination was administered approximately one week later. Student total scores on the items covering first aid and common cold were compared to those on a similar exam administered the previous year and analyzed using a t-test. The responses from students to standardized teaching evaluation forms were compared to responses from the previous year. The instrument contained 12 closed-ended items and a five-point ordinal response scale. A blank section was located at the end of the form for written comments, and the frequency count for repeated comments was determined.

RESULTS

Examination Scores

The grading structure for the class includes three examinations worth 70 percent and a final examination counting 30 percent. The difficulty level and the material covered by examinations in 1996 vs. 1997 were considered equivalent since the majority of the questions were the same. Average examination scores for the areas of first aid and cough/cold for 1996 was 88.66 (SD 11.01) compared to the examination average of 91.67 (SD 8.53) for 1997. This difference was statistically significance as determined by the Student's *t*-test, *t*=4.64 at *P*<0.0025. These two classes were similar in the areas of entering average age and grade point average. The average age was 23.7 years (1996) vs. 23.4 years (1997). The average grade point average was 3.36 (1996) vs. 3.38 (1997).

In the area of first-aid, when traditional teaching methods were used, comparison of pre-and post scores of a short multiple choice quiz yielded an improvement in quiz scores for 76 percent (n=110) of the class. When algorithms were used in teaching first-aid, there was improvement in 85 percent (n=109) of the class from pre-quiz to post-quiz scores. There was not a significant difference in improvements on quiz scores between the two methods in the area of first aid. Questions used for the first aid quiz are found in the Appendix.

Similarly, in the area of common cold, traditional teaching methods yielded a 77.3 percent (n=93) improvement from pre-quiz to post-quiz scores. When algorithms were used 73.2 percent (n=97) showed improvement from pre-quiz to post-quiz scores. There was not a significant difference between using

traditional teaching method vs. algorithms in the area of common cold. Questions used for the common cold quiz are found in the Appendix.

Annual Course Evaluations

Standardized course evaluations completed by the students reflected satisfaction with the learning experience. Results from student evaluations in regard to overall teaching ability of the instructor for 1996 (n=56) were very good (ranked 4.08 on a five point scale) vs. 4.57 (n=93) for the 1997 school year. This difference was statistically significant at P<0.05. Specific statements that showed significant differences (*P*<0.05) and were higher in 1997 compared to 1996 included the ability of the instructor to stimulate thinking (4.43 vs. 4.04) and the instructor encouraged classroom participation (4.37 vs. 4.04). Students were also given the opportunity to provide written comments about the course and the instructors. Student comments from 1997 stated the algorithms provided good clarification. Additionally, approximately 20 evaluations out of 93 made written comments that the class was excellent and the instructor provided useful and practical information. Written comments also stated the pre-test/post-tests reinforced learning.

DISCUSSION

An intervention consisting of teaching via algorithm was introduced into the Nonprescription Products course. This study determined there was a change in examination scores between two classes and an improvement in course evaluations. There was not a difference in quiz scores as measured with pre-post tests when comparing the two different teaching interventions, a possible explanation may be that different learning styles exist among students and it may be that different teaching methods are useful in accommodating these different learning styles. Algorithms give an alternative that may be preferable for some students.

Treatment protocols were developed for use as an easy reference and are not meant to be memorized, a realistic approach for the future is solving specific patient case scenarios with treatment algorithms using a textbook as the reference. As more information becomes available it may be necessary to assist the student in problem solving strategies by teaching where to locate information and how to simulate information.

CONCLUSION

Treatment algorithms represent a different approach to classroom teaching of nonprescription drugs and in some instances may enhance learning. The use of algorithms was associated with improved examination test scores. Students were also receptive to teaching via the algorithm method.

LIMITATIONS

Certain limitations were inherent since the project was conducted on students engaged in a required course. The same content areas of first aid and common cold were compared between the current and previous years; however, the samples consisted of two different classes. Additionally, different content areas were used for comparison of the two methods during the current year. Lastly, pre- and post-test questions were limited in number to comprize a short multiple choice quiz that could be administered during actual class time.

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APPENDIX. QUIZ QUESTIONS

First Aid - Algorithm

1. Five-year-old C.C. has just been stung by a yellow jacket. The area is painful and the child is crying. The most correct treatment includes:
   A. Calamine lotion
   B. Zinc oxide ointment
   C. Lidocaine Spray
   D. Hydrocortisone cream

2. Twenty-year-old A.F. was enjoying a morning canoe trip on the local river. He accidentally gets hit in the nose by a paddle. There is a lot of blood. Treatment includes instructions to:
   A. Blow the nose and lay the person on his back.
   B. Blow the nose and then pack nostrils with a piece of cloth
   C. Pinch the nose and lay the person on his back.
   D. Pinch the nose and lean forward.

3. Seven-year-old J.M. was running around the neighborhood swimming pool enjoying a bright summer day. She accidentally steps on a piece of glass. The foot is bleeding a lot but does not need stitches. After the bleeding has stopped and the wound has been cleaned, the best product is recommended is:
   A. Proxy-strips
   B. ACE bandage
   C. Adhesive tape
   D. Telfa pad

4. Seven-year-old A.I. was riding his bike in the street when he accidentally crashed. He has abrasions to both of his knees. The knees are bleeding a little. After the wounds have been cleaned, treatment includes using a product like:
   A. Kling with paper take
   B. Kling with adhesive tape
   C. Telfa pad with adhesive tape
   D. Telfa pad with cloth tape

5. It is a hot summer's day, 60-year-old Mr. J. was mowing his yard in the middle of the day. He is complaining of headache, extreme amount of sweating and cool feel to his skin. Treatment includes:
   A. Emergency referral to local hospital
   B. IV hydration
   C. Oral fluids, shade, and elevation of feet
   D. Use of ice water to soak person down

6. You are walking your dog in the park. A playground is in the area, and you notice several people assisting a young child who is on the ground. The child is laying on her side with her leg bent in a strange position. You should:
   A. Move the child to the shade and "ice" the area
   B. "Pop" the leg in place
   C. Advise the use of ibuprofen for pain
   D. Seek emergency care

Common Cold - Algorithm

7. Diphenhydramine can be used to treat all of the following except:
   A. Insomnia
   B. Motion sickness
   C. Cough
   D. Constipation

8. An 18-year-old male is requesting an antihistamine that will not make him tired since he is playing in an important sports event.
   A. Clemastine
   B. Pyrilamine
   C. Diphenhydramine
   D. Chlorpheniramine

9. A 65-year-old male with a history of prostate problems is requesting an OTC product to treat cold. A recommendation includes:
   A. Decongestant
   B. Analgesic
   C. Antihistamine
   D. Antihistamine/Decongestant combination

10. If a patient exceeded the recommended dosage of pseudoephedrine, which affect would you not expect to see:
    A. Insomnia
    B. Nervousness
    C. Drowsiness
    D. Tachycardia

11. A mother of a 4-year-old boy has been instructed by her pediatrician to purchase a topical decongestant agent to help with congestion the 4-year-old has been experiencing over the past days. All of the following would be appropriate except:
    A. Oxymetazoline
    B. Xylometazoline
    C. Naphazoline
    D. Phenylephrine

12. A 28-year-old female non-insulin dependent diabetic requests a product for a head cold. Treatment includes all of the following except:
    A. Analgesic
    B. Decongestant
    C. Saline nasal spray
    D. Antihistamine