2002

Rare bacterial infection in a collegiate athlete : a case study

Cynthia Y. Fields
San Jose State University

Follow this and additional works at: https://scholarworks.sjsu.edu/etd_theses

---

Recommended Citation

Fields, Cynthia Y., "Rare bacterial infection in a collegiate athlete : a case study" (2002). *Master's Theses*. 2271.

DOI: <https://doi.org/10.31979/etd.83aj-h9sk>
https://scholarworks.sjsu.edu/etd_theses/2271

This Thesis is brought to you for free and open access by the Master's Theses and Graduate Research at SJSU ScholarWorks. It has been accepted for inclusion in Master's Theses by an authorized administrator of SJSU ScholarWorks. For more information, please contact scholarworks@sjsu.edu.

INFORMATION TO USERS

This manuscript has been reproduced from the microfilm master. UMI films the text directly from the original or copy submitted. Thus, some thesis and dissertation copies are in typewriter face, while others may be from any type of computer printer.

The quality of this reproduction is dependent upon the quality of the copy submitted. Broken or indistinct print, colored or poor quality illustrations and photographs, print bleedthrough, substandard margins, and improper alignment can adversely affect reproduction.

In the unlikely event that the author did not send UMI a complete manuscript and there are missing pages, these will be noted. Also, if unauthorized copyright material had to be removed, a note will indicate the deletion.

Oversize materials (e.g., maps, drawings, charts) are reproduced by sectioning the original, beginning at the upper left-hand corner and continuing from left to right in equal sections with small overlaps.

Photographs included in the original manuscript have been reproduced xerographically in this copy. Higher quality 6" x 9" black and white photographic prints are available for any photographs or illustrations appearing in this copy for an additional charge. Contact UMI directly to order.

**ProQuest Information and Learning
300 North Zeeb Road, Ann Arbor, MI 48106-1346 USA
800-521-0600**

UMI®

**RARE BACTERIAL INFECTION IN
A COLLEGIATE ATHLETE: A CASE STUDY**

A Project

Presented to

The Faculty of the Department of Human Performance

San Jose State University

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

By

Cynthia Y. Fields

May, 2002

UMI Number: 1408788

**Copyright 2002 by
Fields, Cynthia Yvonne**

All rights reserved.

UMI®

UMI Microform 1408788

**Copyright 2002 by ProQuest Information and Learning Company.
All rights reserved. This microform edition is protected against
unauthorized copying under Title 17, United States Code.**

**ProQuest Information and Learning Company
300 North Zeeb Road
P.O. Box 1346
Ann Arbor, MI 48106-1346**

© 2002

Cynthia Y. Fields

ALL RIGHTS RESERVED

APPROVED FOR THE DEPARTMENT OF HUMAN PERFORMANCE

Learnor Kahanov, EdD, ATC

Barbara Conry, PhD

David Furst, PhD

APPROVED BY THE UNIVERSITY

ABSTRACT
RARE BACTERIAL INFECTION IN
A COLLEGIATE ATHLETE: A CASE STUDY

by Cynthia Y. Fields

Streptococcal toxic shock syndrome (STSS) is a rare, often misdiagnosed, illness assessed by specific signs and symptoms, that may be mistaken for influenza. STSS is not typically identified in the athletic population, yet an infected patient has up to an 80% mortality rate. The purpose of this case study is to educate athletic trainers about STSS, including signs and symptoms, so athletes can be referred to a physician promptly and accurately, when appropriate. The quickly progressing symptoms and high mortality rate often make this illness difficult to treat. Therefore, it is essential that the athletic trainer be aware of STSS signs and symptoms and proper evaluation techniques. Early detection and proper referral can decrease complications of STSS. This case study was prepared in article format according to the *Author's Notes* and submitted to the *Journal of Athletic Training*.

ACKNOWLEDGEMENTS

I would like to acknowledge and extend my appreciation to the following people who assisted with the completion of this project. First and foremost, I would like to extend a very sincere thank you to the participant of this study. An enormous thank you to Dr. Kahanov, my thesis advisor, for her direction, guidance, and perseverance. I am very grateful for all the time and dedication she has given this project. Thank you to my committee, Dr. Furst and Dr. Conry, for all their support and guidance to complete this study. A very loving thank you goes out to my parents, Wayne and Ginny Fields, although so very far away, they provided me with endless support and encouragement to keep me going until the finish. Finally, a very special and loving thank you to John, for his continued love, support, and understanding throughout the past two years of my educational experience, especially this project. Thanks again to all who pointed me in the right direction!

Table of Contents

List of Tables.....	viii
Project	
Article Submission.....	1
Cover Page.....	1
Contribution Form.....	2
Release Form.....	3
Abstract.....	4
Introduction.....	5
Case Report.....	5
Discussion.....	9
Conclusions.....	13
References.....	16
Extended Support Material.....	18
Chapter 1	
Introduction.....	19
Problem.....	21
Purpose.....	22
Delimitations.....	22
Limitations.....	22
Operational Definitions.....	23
Project Completion.....	24

Chapter 2

Review of Literature.....	25
Case Study Characteristics.....	25
Athletic Training Competencies and Continuing Education.....	27
STSS Pathogenesis, Signs and Symptoms.....	28
Streptococcal Toxic Shock Syndrome.....	29
STSS Case Reports.....	31
STSS Incurred from Common Injuries.....	33
STSS Treatment.....	36
Dissemination of Group A Streptococcal Infections.....	39
Summary.....	41

Chapter 3

Methods.....	43
Research Design.....	43
Participant.....	44
Procedure.....	44
Project Completion.....	46
References.....	47
Appendix A: <i>Author's guide for submission to Journal of Athletic Training</i>.....	52
Appendix B: Consent to participate in study form.....	55
Appendix C: NATA Competency Guide.....	59

Table of Tables

Table 1. Streptococcal Toxic Shock Syndrome.....	29

**RARE BACTERIAL INFECTION
IN A COLLEGIATE ATHLETE: A CASE REPORT**

By

**Cynthia Y. Fields
San Jose State University**

**Learmor Kahanov, EdD, ATC
San Jose State University
Program Director-Graduate Athletic Training
One Washington Square
San Jose, CA 95192-0054
408-924-3040
leamor@email.sjsu.edu**

**David Furst, PhD
San Jose State University**

**Barbara Conry, PhD
San Jose State University**

JAT# _____ Title of the manuscript: Rare Bacterial Infection In A Collegiate Athlete: A Case Report

Please write or type in each author's last name, and then indicate the contributions of that person in the appropriate categories.

Contributors who do not meet the criteria for authorship should be thanked in the Acknowledgements section.

Contribution*											
Author's Last Name	conception & design	acquisition of data	analysis & interpretation of the data	drafting of the article	critical revision of the article for important intellectual content	final approval of the article	provision of study materials or patients	statistical expertise	obtaining of funding	administrative, technical, or logistic support	collection & assembly of data
Fields	X	X	X	X	X	X	X			X	X
Kahanov	X			X	X	X				X	
Furst					X	X				X	
Conry					X	X				X	

*Contribution descriptions reprinted with the permission of the *Annals of Internal Medicine*.

Release of information for case report:

Date: _____

I, _____ freely give my consent for the release of information regarding my medical history, illness, surgery, and outcome for use in the following case report, which is being submitted to the *Journal of Athletic Training*.

Author(s): Cynthia Y. Fields, Leamor Kahanov, David Furst, Barbara Conry

Title: Rare bacterial infection in a collegiate athlete: a case report

I understand that this information may be used in publication and that my name will remain confidential.

Signature: _____

Witness: _____

1 ABSTRACT

2
3 A CASE REPORT:

4
5 A RARE BACTERIAL INFECTION IN A COLLEGIATE ATHLETE

6
7 **Objective:** The purpose of this case study is to present a unique illness on one athlete.
8 Signs and symptoms, as well as treatment, of streptococcal toxic shock syndrome (STSS)
9 were mentioned so appropriate and prompt referral to a physician can be determined.

10
11 **Background:** STSS is a rare, often misdiagnosed illness assessed by specific signs and
12 symptoms often mistaken for influenza. The case fatality rate in STSS often approaches
13 80%. Individuals who develop STSS have a large chance of death. Thus, education and
14 advertisement of STSS, symptoms, and treatment are necessary. This case study focuses
15 on a female Division I athlete. Initial complaints of a stuffy nose, watery eyes, and sore
16 throat, resulted in hospitalization 9 days post initial symptoms. Severe sore throat, high
17 fever, and an unusual red rash, among other symptoms were determined by a physician in
18 the student health center to be serious. The athlete was transferred to the emergency
19 room for further evaluation.

20
21 **Differential Diagnosis:** Strep throat, influenza, mononucleosis, pneumonia, scarlet fever,
22 and streptococcal toxic shock syndrome.

23
24 **Treatment:** During the lengthy hospital stay, the athlete was dispensed penicillin and
25 clindamycin to control STSS symptoms. The athlete also incurred pneumonia during the
26 stay, resulting in lung surgery. Her rehabilitation program consisted of rest, with a
27 gradual return to activities of daily living and exercise.

28
29 **Uniqueness:** This case study is unique since the athlete was completely healthy and
30 suddenly contracted a serious bacterial infection. STSS is rare: only 300 cases were
31 reported nationwide in 1999.¹ No STSS cases are documented in the literature regarding
32 collegiate athletes. The high mortality rate of STSS infected patients approaches 80%;
33 the survival of this 21 year old female athlete was unexpected.

34
35 **Conclusions:** The athletic trainer should be aware of STSS signs and symptoms, know
36 proper evaluation techniques, and oversee the progression of, what is often thought to be,
37 pharyngitis or influenza. Early detection and proper referral can decrease complications
38 of streptococcal toxic shock syndrome.

39
40 **Key Words:** streptococcal toxic shock syndrome, bacterial infection, Group A
41 streptococcal bacteria

42

INTRODUCTION

43

44

45

46

47

48

49

50

51

52

53

54

55

A CASE REPORT

56

57

58

59

60

61

62

Streptococcal toxic shock syndrome (STSS) is not typically identified in the athletic population, yet when infected, a patient has up to an 80% mortality rate. STSS is most often encountered in the general population. Symptoms of STSS may be masked by other common illness such as strep throat, pharyngitis, or influenza-like symptoms. In 1999, only 300 cases of STSS were reported nationwide to the Center for Disease Control and Prevention in Atlanta.¹ Due to the rarity, difficulty in diagnosis, and severe consequences, prompt referral is essential.

Athletic trainers are in the unique position to evaluate injuries and illness, properly refer them, as well as treat and rehabilitate the injuries and illnesses as the first defense in athlete health care. Therefore, athletic trainers, who often serve as the first health care providers, must understand the severity of STSS, and signs and symptoms to effectively triage the athlete.

A 21 year old female collegiate track and field athlete presented in the athletic training room complaining of a stuffy nose, watery eyes, and sore throat. After examination and normal temperature reading, the athlete was administered throat lozenges and over-the-counter medicines to control cold symptoms. Three days later, she competed in an indoor track meet and continued to receive over-the-counter medications to decrease cold symptoms. During the first four days of influenza symptoms, the athlete did not have any new complaints.

63   After returning to campus, five days post initial symptoms, she reported to the
64   athletic training room complaining of increasing symptoms. The athlete was evaluated
65   by a physician and diagnosed with a viral illness accompanied by a fever approaching
66   103° F. The athlete was sent home to rest.

67   Nine days post initial symptoms, the athlete reported to the athletic training room
68   during morning hours. She was pale, coughing, could not catch her breath, had a hoarse
69   voice, and complained of a severe sore throat. An immediate physician exam detected an
70   erythematous (red and sunburn-like) rash on her mid section. The physician suspected
71   mononucleosis and dehydration and referred her to the student health center.

72   While at the student health center, the athlete was diagnosed with strep
73   pharyngitis. Her blood pressure was noted low and intravenous fluids were started. Due
74   to poor treatment response, she was transferred to the hospital. Upon entering the
75   emergency room, she was hypotensive (106/35), with a temperature of 104.2° F,
76   respiration rate of 30 and tachycardia of 150. The diffuse erythematous rash was
77   examined and she was diagnosed with scarlet fever.

78   The athlete's complaints, at the time of hospital admission, were pain down her
79   right side (especially in the right chest), mild headache, severe cough, difficulty with
80   breathing, and severe sore throat. The attending physician observed erythema (bright red
81   coloring) of the tongue and posterior pharynx. Her lymph nodes were tender in the
82   anterior cervical chain. The physician also observed decreased breath sounds throughout
83   the right lung with adventitious crackling sounds when she took an inspiration prior to
84   cough. Her strep throat screen was positive. The chest x-ray identified diffuse

85 abnormality in the right middle and lower lung lobes, which caused concern for adult
86 respiratory distress syndrome (ARDS). The attending physician diagnosed this athlete
87 with Group A streptococcal toxic shock syndrome, complicated by acute renal
88 insufficiency (inability or reduced capacity of the kidneys to remove waste products from
89 the blood at the normal rate), pneumonia, elevated liver enzymes (proteins), and possible
90 lung injury (Tables 1 & 2). This athlete was diagnosed with a life threatening illness
91 complicated by potentially deadly complications. Her symptoms were monitored and
92 treated carefully to ensure that she did not regress, which could result in death.

93 Treatment Plan

94 The athlete was dispensed a high dose of penicillin intravenously along with
95 clindamycin to control STSS. The athlete was monitored closely observing blood gas
96 levels to ensure no acidemia (increase in the acidity of blood due to hydrogen ions)
97 formed. In addition, aggressive treatment with intravenous fluids was administered for
98 renal insufficiency and creatinine levels were closely followed to prevent renal failure or
99 complications leading to disease. Antibiotics were dispensed to aid in pneumonia
100 treatment. Oxygen support was provided to reduce her respiratory rate. Elevated liver
101 enzymes cause lack of blood supply to the liver and may cause additional damage to the
102 organ, therefore, the athlete's liver enzymes were carefully monitored. In addition, the
103 liver acts as a filter, so in a toxic event liver function is crucial.

Complications

Penicillin and clindamycin controlled her STSS; however, the athlete continued to have spiking fevers up to 102° F every 2 days. Two weeks after initial symptoms, the athlete underwent a chest computed tomography (CT) scan which identified a large right pleural effusion, small left effusion, and a hollow space in the left lower lobe (fluid exceeding 300mL was visible in the pleural lining of both lungs). Diagnosis was persistent effusion with evidence of pleural peeling (shedding of the lung lining), and strep empyema (pus in the lung with strep bacteria involved). One week post chest CT scan, surgical removal of the lung surface layer using an endoscope resolved any residual lung complications.

During surgery, 600 cubic centimeters (cc) of bloody fluid were evacuated from the right lung. The extensive pleural peel was removed and hemostasis was achieved. The lung was inflated with no residual complications. Two thoracostomy tubes were placed for drainage. Immediately after transfer back to the floor from surgery, the athlete began to improve. Two units of packed red blood cells were transfused when her hematocrit level dropped to 18; from a normal hematocrit level of 36. Her hematocrit then rose to 25 and was considered stable.

The athlete began ambulating by postoperative day 3. She was then transitioned to oral pain medications and her chest tubes were discontinued. By postoperative day 4 her fever subsided and her temperature was normal. Three-and-a-half weeks after initial symptoms of the illness, the athlete was discharged from the hospital with a normal temperature, clear lung sounds, stable vital signs, and normal labs. Follow-up

126 appointments with general physicians and pulmonologists were positive. The athlete was
127 instructed to avoid heavy lifting for 6 weeks and to progress activities as tolerated. The
128 athlete did not return to competitive sports, with no plans to reenter organized athletics.
129 She continues to exercise regularly for health and enjoyment.

130 DISCUSSION

131 Streptococcal Toxic Shock Syndrome

132 Hypotension, shock, and multi-system organ failure characterize streptococcal
133 toxic shock syndrome. The life threatening aspect of this illness makes proper
134 recognition by an athletic trainer essential. STSS can occur in individuals with Group A
135 streptococcal (GAS) infections such as strep throat or pharyngitis.^{2,3,4,5} GAS infections
136 may spread from person to person through large respiratory droplets, coughing or
137 sneezing, or direct contact.^{6,7,8} STSS is not spread through touch, unless contact is made
138 between a patient's secretions and an open wound.^{7,8} Individuals may be carriers of GAS
139 infections without incurring illness; thus transmitting the disease to others is important to
140 understand in the prevention of STSS.⁷

141 STSS has three components that must be met in order to be classified as a definite
142 case.^{2,9,10} Three criteria of STSS are: 1) isolated Group A streptococci from an isolated
143 site, 2) hypotension, and 3) a minimum of two components of multi-system organ
144 failure.^{2,9} A true case of STSS can be identified only if Group A streptococci is isolated
145 from a normally sterile site characterized by blood, cerebrospinal fluid, pleural fluid or
146 peritoneal fluid, tissue biopsy, or surgical wounds.¹¹ GAS isolation from a nonsterile site
147 such as the throat, sputum, vagina, or a superficial skin lesion, would only be a probable

148 case.¹¹ In addition, the site of isolation aids in identification of infection type (Table 1).
149 This information is useful during the evaluation and assessment process. Only a
150 physician can determine STSS through special tests and labs. Thus, it is essential that an
151 athletic trainer recognize the initial signs and symptoms for prompt referral.

152 STSS Pathogenesis, Signs and Symptoms

153 Streptococcal bacteria usually enter the body through the skin. Persons most
154 susceptible to streptococcal infections resulting in STSS have sustained an open wound,
155 from surgery, childbirth, common accident, or chickenpox. STSS cases generally
156 develop within 24-72 hours of minor non-penetrating trauma resulting in deep bruises
157 and muscle strains.¹² Persons of all ages can be affected by streptococcal toxic shock
158 syndrome, without predisposing underlying diseases.¹² As in this case, the athlete had no
159 previous history of an illness, only a chronic knee pain occasionally controlled by
160 Ibuprofen and under physician care. Reports state that she had a sore throat and other
161 flu-like symptoms for 11 days prior to seeking a physician. The athlete stated that she
162 had not eaten for 3 days prior to the hospital visit, nor had any fluid intake due to nausea.
163 The cause of the STSS infection in the athlete is unknown, like most cases. In addition,
164 the portal of entry of the GAS is unknown in 25% of known cases.^{12,13,14}

165 Athletic trainers can help assess or suspect STSS by continuous communication
166 with the ill athlete. When the athlete has a combination of unusual signs or symptoms
167 such as a sunburn-like rash, unusual pain in an extremity or mid section, high fever, low
168 blood pressure, fast heart rate, or difficulty breathing, STSS should be suspected. Renal
169 insufficiency is another sign of STSS. Symptoms of renal insufficiency include

170 decreased urine output, lower leg swelling, changes in mental status (confusion,
171 hallucinations, drowsiness), nausea, vomiting, bad breath odor, or bloody stool. Tests to
172 diagnose renal insufficiency include laboratory tests, as well as heart and lung sounds.
173 Heart murmurs may be audible along with crackles in the lungs.

174 Current complications of GAS are severe, such as aggressive soft tissue infection,
175 shock, adult respiratory distress syndrome and renal failure. Pain is the most common
176 initial symptom of STSS, in addition to fever.¹² Severe pain is often abrupt in onset and
177 severity, commonly involving an extremity or mimicking pelvic inflammatory disease,
178 pneumonia, or an acute myocardial infarction. Approximately 20% of patients have
179 influenza-like symptoms characterized by fever, chills, nausea, vomiting, and diarrhea.^{2,14}
180 Prompt diagnosis, referral, and/or treatment are necessary to decrease morbidity.

181 Treatment

182 Penicillin is often used to treat streptococcal infections. Some failures of
183 penicillin treatment do occur with streptococcal infection. Five to 20% of patients with
184 streptococcal pharyngitis are immune to penicillin treatment.^{12,15} More aggressive GAS
185 infections respond less well to penicillin and continue to be associated with high
186 mortality rates. Some aggressive infections include necrotizing fasciitis, subcutaneous
187 gangrene, and myositis.

188 Clindamycin is frequently a part of drug therapy for patients with severe
189 streptococcal infections. Since clindamycin inhibits protein synthesis, efficacy is not
190 dependent on penicillin binding proteins.¹³ Since clindamycin inhibits the synthesis of
191 both proteins and exotoxins, action on bacteria persists longer than that of penicillin.

192 Many experts recommend intravenously administered clindamycin in addition to
193 penicillin.¹³ However, clindamycin should not be used alone for treating a severe
194 invasive GAS infection until the isolate is determined to be sensitive to this agent.¹³ A
195 small portion of Group A streptococcal bacterial strains are clindamycin resistant
196 requiring a multi-medicinal approach to STSS using a combination of clindamycin and
197 other medications. Therefore, other medications are sometimes used as alternatives such
198 as intravenous immunoglobulin (IVIG).

199   IVIG may be beneficial when given in addition to appropriate antimicrobial
200 therapy for streptococcal toxic shock syndrome.¹⁶ IVIG is understood to work “by
201 blocking or inactivating the exotoxins that stimulate proliferation of T lymphocytes
202 resulting in a decrease in the production of inflammatory cytokines”.¹⁶ Since cytokines
203 have a major role in the progression of STSS, other agents such as corticosteroids, which
204 decrease production or block activity of the cytokines, may be beneficial in the treatment
205 of severe GAS infections.

206   Information concerning the medications that may be used to treat STSS is not
207 concrete. Penicillin has been used for many years and continues to be effective.
208 However, with more than one organism disrupting the immune system, clindamycin
209 should be used, especially in cases of streptococcal toxic shock syndrome. Newer
210 therapies such as IVIG therapy has been used in several cases of STSS and proves to be
211 extremely effective, but scientific studies supporting this theory are limited. More
212 research needs to be conducted to determine successful STSS treatment. In addition,

213 there is no data stating the percentage of people that recover and return to physical
214 activity.

215 CONCLUSIONS

216 Sports medicine personnel must be well trained in clinical evaluation techniques
217 to properly assess and refer illnesses. Knowledge of the unique signs and symptoms, or a
218 combination thereof, is of utmost importance for accurate and prompt referral. Referral
219 of the ill athlete to a physician should not be delayed when a combination of STSS
220 symptoms is suspected. STSS often has a rapid onset of signs and symptoms with quick
221 deterioration of organs and tissues, followed by shock, surgeries, and often death.^{12,13,17}
222 Treatment protocols should be under the direct care of physicians with proper medicinal
223 therapies.

224 Fortunately this athlete recovered with minor side effects. She continues to have
225 numbness on her right chest near the incision sites and on her right IT band, as well as
226 pain in her chest when taking a deep breath. The athlete did not return to competitive
227 sports due to graduation from college, however she continues to exercise regularly.
228 While interviewing the athlete, she expressed no desire to compete again. She also
229 discussed her new outlook on life; priority is now given to self-care and personal health
230 and well being. Lastly, she expressed her enjoyment of recreational activities.

231 Table 1. Streptococcal Toxic Shock Syndrome: definite case vs. probable case
 232

Definite Case	Probable Case
1. GAS from a sterile site (blood, pleural, peritoneal, or cerebrospinal fluid, tissue biopsy, surgical wound)	1. GAS from a nonsterile site (throat, sputum, vagina, superficial skin lesion)
2. Hypotension	2. Hypotension
3. Clinical and laboratory abnormalities: (requires two or more of the following):	3. Clinical and laboratory abnormalities: (requires two or more of the following):
a) renal impairment	a) renal impairment
b) coagulopathy	b) coagulopathy
c) liver abnormalities	c) liver abnormalities
d) adult respiratory distress syndrome	d) adult respiratory distress syndrome
e) extensive tissue necrosis (necrotizing fasciitis)	e) extensive tissue necrosis (necrotizing fasciitis)
f) erythematous rash	f) erythematous rash

233 Table 2. Athlete's symptoms compared to the differential diagnoses.

Athlete's Symptoms	Differential Diagnosis
• Severe sore throat • Cough • Muscle/body aches • Fever: 104° F • Difficulty breathing • Hoarse voice • Sunburn-like rash (erythematous) • Hypotensive • Tachycardia • Headache • Pain down right side and chest • Bright red erythema of tongue • Tender lymph nodes • Acute renal insufficiency • Pneumonia • Elevated liver enzymes • shock	STSS • Hypotension • Multi-organ failure • Influenza-like symptoms: fever, chills myalgia, diarrhea • High fever • Erythematous rash • Tachycardia • Shock • Renal Impairment • Respiratory distress • Localized pain in chest, abdomen, or pelvis SCARLET FEVER • Bright red tongue • Sore throat • Fever • Headache • Erythematous rash on face & trunk • Nausea, vomiting • Myalgia • Malaise STREP THROAT • Red throat • Sore throat • Fever • Swollen & tender lymph nodes • White spots on tonsils • Headache • General aches & pains • Malaise

- 235 1. Perrin T. Children contract a rare illness: three hospitalized with toxic shock. *Kansas*
236 *City Star*. January 18,2001pA1 [ProQuest.]
237
- 238 2. The Working Group on Severe Streptococcal Infections. Defining the group A
239 streptococcal toxic shock syndrome: rationale and consensus definition. *JAMA*.
240 1993;269:390-392.
241
- 242 3. Patlak M. Strep demands immediate care. *FDA Consumer*. 1991;25:24-26.
243
- 244 4. Gregory T. Scarlet fever and its relatives. *Patient Care*. 1998;32:109-110.
245
- 246 5. Fraulin FOG, Giuffre MJ, Campbell DD, Lobay GW, Edwards DC. Invasive group A
247 streptococcal soft tissue infection and the streptococcal toxic shock like syndrome. *Can J*
248 *Plas Surg*. 1995;3:30-34.
249
- 250 6. Gray BM, Evans AS, Brachman PS. *Bacterial infections of humans: epidemiology*
251 *and control*. 2nd ed. New York, NY: Plenum Publications;1991.
252
- 253 7. Utah Department of Health Bureau of Epidemiology 1998. Streptococcal toxic shock
254 syndrome. Available at: <http://hlunix.hl.state.ut.us/els/epidemiology/epifacts.html>.
255 Accessed April 18, 2001.
256
- 257 8. Schwartz B, Elliot JA, Butler JC, Simon PA, Jameson BL, Welch GE, et al. Clusters
258 of invasive group A streptococcal infections in family, hospital, and nursing home
259 settings. *Clin Infect Dis*. 1992;15:277-284.
260
- 261 9. Forni AL, Kaplan EL, Schlievert PM, Roberts RB. Clinical and
262 microbiological characteristics of severe group A streptococcus infections and
263 streptococcal toxic shock syndrome. *Clin Infect Dis*. 1995;21:333-340.
264
- 265 10. Hoge CW, Schwartz B, Talkington DF, Breiman RF, MacNeil EM,
266 Englander SJ. The changing epidemiology of invasive group A streptococcal infections
267 and the emergence of streptococcal toxic shock-like syndrome. *JAMA*. 1993;269:384-
268 389.
269
- 270 11. Centers for Disease Control and Prevention. CDC defines group A
271 streptococcal toxic shock syndrome. *Am Fam Physician*. 1993;47:1643-1645.
272
- 273 12. Stevens DL. Streptococcal toxic-shock syndrome: spectrum of disease,
274 pathogenesis, and new concepts in treatment. *Emerging Infect Dis*. 1995;1:78-91.

- 275 13. American Academy of Pediatrics Committee on Infectious Diseases. Severe
276 invasive group A streptococcal infections: a subject review. *Pediatrics*. 1998;101:136-
277 141.
278
279 14. Hauser AR. Another toxic shock syndrome. *Postgrad Med*. 1998;104:31.
280
281 15. Stevens DL, Gibbons AE, Bergstrom R, Winn V. The eagle effect
282 revisited: efficacy of clindamycin, erythromycin, and penicillin in the treatment of
283 streptococcal myositis. *J Infect Dis*. 1988;158:23-28.
284
285 16. Lamothe F, D'Amico P, Ghosn P, Tremblay C, Braidy J, Patenaude JV. Clinical
286 usefulness of intravenous human immunoglobulins in invasive group A streptococcal
287 infections: case report and review. *Clin Infect Dis* 1995;21:1469-1470.

EXTENDED SUPPORT MATERIAL

Chapter 1

INTRODUCTION

Streptococcal toxic shock syndrome (STSS) is not typically identified in the athletic population, yet, when infected a patient has up to an 80% mortality rate. STSS is a rare, often misleading and misdiagnosed illness mostly encountered in the general population. In 1999, only 300 cases of STSS were reported nationwide to the Center for Disease Control and Prevention in Atlanta (Perrin, 2001). Symptoms of STSS may be masked by other common illnesses such as strep throat, pharyngitis, or influenza-like symptoms. In addition, several types of toxic shock syndrome exist, such as staphylococcal and streptococcal.

Due to the rarity, difficulty in diagnosis, and severe consequences, prompt referral is essential. Athletic trainers, who often serve as the first health care provider, must understand the severity of the illness, as well as signs and symptoms to effectively triage the athlete. Therefore, the purpose of this project is to present a case study involving an athlete with STSS to better prepare athletic training professionals to identify this disease.

Recognition of emerging infectious diseases begins with knowledge of the disease, especially clinical features, epidemiology, and diagnosis of the illness. Knowledge of disease trends and emerging infections is beneficial to athletic trainers and may be obtained from colleagues, regional meetings, or publications (Strausbaugh, 1997). Because STSS is not required in athletic training educational programs (see Appendix C), certified athletic trainers (ATC) are responsible for acquiring this knowledge on their own. The uniqueness of this illness detailed in a case study is an attractive incentive to

entice ATCs to read about STSS. In addition, this has potential to be the first article focusing specifically on a competitive athlete. Knowledge of STSS enables athletic trainers to be better prepared to consider the diagnosis of an emerging infection when clinical features and epidemiological setting suggest something out of the ordinary.

Streptococcal toxic shock syndrome is characterized by hypotension, shock, and multi-system organ failure. The life threatening aspect of this injury makes proper recognition by an athletic trainer essential. STSS can occur in some individuals with Group A streptococcal infections such as strep throat or pharyngitis (Patlak, 1991; Gregory, 1998; Fraulin, Giuffre, Campbell, Lobay & Edwards, 1995; The Working Group on Severe Streptococcal Infections, 1993). Group A streptococcal (GAS) infections may spread from person to person through large respiratory droplets, coughing or sneezing, or by direct contact (Gray, Evans & Brachman, 1991; Schwartz, Elliot, Butler, Simon, Jameson, Welch, & Facklam, 1992; Utah Department of Health, 1998). STSS is not spread through touch, unless contact is made between patient's secretions and an open wound (Utah Department of Health; Schwartz et al.). Important to understand is the concept that people can be carriers of GAS infections without becoming sick; thus transmitting the illness to others (Utah Department of Health). As an athletic trainer these concepts are crucial to preventing the spread of STSS.

STSS is diagnosed as an illness when no other bacteria or virus can be identified as a more likely cause of the illness. STSS has three components that must be met in order to be classified as a definite case (The Working Group on Severe Streptococcal Infections, 1993; Forni, Kaplan, Schlievert & Roberts, 1995; Hoge, Schwartz,

Talkington, Breiman, MacNeil & Englander, 1993). Three criteria of STSS are: 1) isolated Group A streptococci from an isolated site, 2) hypotension, and 3) a minimum of two components of multi-system organ failure (Forni et al.; The Working Group on Severe Streptococcal Infections). However, if one of the three criteria is absent, the case is considered probable. In addition, a true case of STSS can be identified only if Group A streptococci can be isolated from a normally sterile site characterized by blood, cerebrospinal fluid, pleural fluid or peritoneal fluid, tissue biopsy, or surgical wounds (Centers for Disease Control and Prevention, 1993). The Group A streptococci from a nonsterile site such as the throat, sputum, vagina, or a superficial skin lesion, would only be a probable case (Centers for Disease Control and Prevention, 1993). In addition, the site of isolation will serve to identify the type of infection (see Table 1). This information is useful during the evaluation and assessment process. Since only a physician can determine STSS through special tests and laboratories, it is essential that an athletic trainer recognize the initial signs and symptoms for prompt referral.

Problem

The case fatality rate in streptococcal toxic shock syndrome often approaches 80%. Individuals who develop STSS have a great chance of death, making education and advertisement of STSS, the symptoms, and the treatment necessary to health care workers, including certified athletic trainers (ATC).

ATCs are likely to be the first health care worker encountered by athletes yet they are not required to learn STSS signs and symptoms. The NATABOC competency manual was published in 1999 and is implemented in all accredited undergraduate athletic

training programs for those students who wish to seek national certification. Skills and knowledge listed in the competency manual are simply minimal requirements for the proficiency of athletic trainers to take the NATABOC national certification exam. Therefore, the objective of this case study is to introduce STSS to many athletic trainers and encourage education pertaining to this illness.

Purpose

Streptococcal toxic shock syndrome is a rare, often misdiagnosed illness assessed by specific signs and symptoms that can be mistaken for influenza. Athletic trainers are usually the first individuals in the health care system, specifically in athletic departments, to come in contact with an injured or ill athlete. Therefore, athletic trainers should be well educated on all aspects of health issues including STSS. Thus, the purpose of this case study is to educate athletic trainers about STSS, including signs and symptoms, so athletes can be referred to a physician promptly and accurately when appropriate.

Delimitations

- 1) This study will specifically focus on a 21 year old female collegiate athlete and her illness with streptococcal toxic shock syndrome and associated complications.
- 2) The review of literature will be delimited to articles and research pertaining only to streptococcal toxic shock syndrome and Group A streptococcal infections.

Limitations

- 1) This case study focuses on one individual.
- 2) Case specifics cannot be generalized to other athletic populations or athletes.

Operational Definitions

Athlete – A person participating in competitive collegiate sports teams that require physical skills and utilize strength, power, endurance, speed, flexibility, range of motion, or agility.

Athletic Trainer (ATC) – An individual who has the minimum of a bachelor's degree, has passed the NATABOC national certification examination and maintains CEU requirements. This individual works within the scope of practice set by the NATA to give first rate health care to athletes.

Competencies – Skills student athletic trainers are taught in order to prepare for the NATABOC national certification examination and complete an NATA CAAHEP educational program.

NATA – National Athletic Trainers' Association. An organization of sports medicine professionals used to enhance the athletic training profession through education and research in the prevention, management, and rehabilitation of injuries.

NATABOC – National Athletic Trainers' Association Board of Certification. The group of sports medicine professionals who certify athletic trainers as well as helps maintain the educational process through continuing competency programs while defining the scope of practice.

Shock – The heart is unable to exert adequate pressure to circulate enough oxygenated blood to the vital organs. Symptoms include paleness of skin, glazed eyes, dilated pupils, weak pulse, shallow and increased breathing rate, incontinence (Thomas, 1993).

STSS – Streptococcal Toxic Shock Syndrome. A specific strain of Group A streptococcal bacteria that enters the body through various methods and then causes severe illness, along with tissue and organ damage often resulting in death.

Project Completion

This case study will be compiled into a journal article and submitted to the *Journal of Athletic Training* based on the *Author's Guide* (see Appendix A).

Chapter 2

REVIEW OF LITERATURE

Streptococcal toxic shock syndrome (STSS) has been identified and researched since the 1950s. Research in STSS, such as this case study, has the potential to aid in accurate diagnosis, referral, and treatment of a deadly illness. This case study will detail a healthy collegiate track and field athlete who was diagnosed with STSS. Education on this unique STSS case is necessary for athletic trainer knowledge since this illness is generally not taught in athletic training education programs and has a high morbidity rate if not promptly diagnosed.

This chapter will be presented in five sections: 1) case study characteristics, 2) athletic training competencies and continuing education, 3) STSS pathogenesis, signs and symptoms, 4) STSS case reports, and 5) STSS treatments. A summary of previous studies and case reports pertaining to STSS and Group A streptococci bacteria, as well as information on case study research and athletic training competencies and duties will follow. Also included in this chapter are the causes, diagnoses, treatments, spreading, and differentiation between influenza, strep throat, and toxic shock syndrome.

Case Study Characteristics

A qualitative case study is an intensive, holistic description and analysis of a specific phenomenon such as an institution, a person, or a social unit (Merriam, 1988). The case study approach is often the best methodology for addressing problems such as practice issues and extending the knowledge base of various aspects of education, in which understanding is sought in order to improve practice (Merriam). Stake (1995)

describes a case study as specific, complex, and functioning, but not necessarily a problem, a relationship, or a theme; instead it incorporates all three to make the case study an entity.

The first characteristic of a case study is particularistic, meaning the study focuses on a particular situation or event (Merriam, 1988). Description is the second characteristic where the end product of a case study is a complete and accurate account of the incident being investigated (Merriam). The third characteristic is heuristics, when the case study expands the reader's understanding of the event (Merriam). The final characteristic is induction, meaning that as new data emerges already stated generalizations, concepts, or hypotheses may change (Merriam). The design of case studies is based on derived research questions. The current case study satisfies all of the above characteristics by focusing on one individual with streptococcal toxic shock syndrome including specific qualities that present a meaningful description of events to expand the knowledge of athletic trainers.

An essential part of a case study presentation is the data gathering and analysis process. Common techniques of collecting data include interview, documentary analysis, observation, and reviewing documents (Merriam, 1988). To analyze data for a case study the investigator must rely on his/her own knowledge and abilities. Therefore, the researcher should have organizational skills, as well as, an open mind when obstacles in data collection and analysis occurs in order to best analyze data and compile an accurate case study (Stake, 1995).

Athletic Training Competencies and Continuing Education

Athletic trainers are the critical link between sport programs and the medical community. Athletic trainers are the first medical personnel athletes often encounter. The primary duties and responsibilities of an athletic trainer include 1) injury prevention, 2) recognition and evaluation of injuries, 3) management, treatment, and disposition of athletic injuries 4) rehabilitation, 5) organization and administration, 6) education and counseling (Anderson & Hall, 1995). In order to become a certified athletic trainer (ATC), students must take the national athletic trainers' association board of certification national certification examination (NATABOC-NCE). Prerequisites of the NATABOC-NCE include completion of 1250 competencies and a bachelor's degree from a NATABOC Commission on Accreditation of Allied Health Education Programs (CAAHEP) accredited educational program. According to the National Athletic Trainers' Association (NATA) educational competency booklet, all entry level athletic trainers, who wish to take the NATABOC-NCE, must possess the ability to perform the competencies within each domain with proficiency (National Athletic Trainers' Association Athletic Training Educational Competencies, 1999), yet knowledge of STSS signs and symptoms are not one of the required competencies.

To maintain certification NATABOC requires 80 hours of continuing education units (CEU's) within a 3-year reporting period (Anderson & Hall, 1995). CEU's provide an opportunity for athletic trainers to acquire new innovative skills and techniques, and learn current research within the profession. CEU's may be accumulated by attending workshops, seminars, professional publications/speaking, review of professional journals

and quiz completion based on material in the journal, and post graduate education.

Providing CEU's in an area not well known in sports medicine can enhance an athletic trainer's knowledge, such as STSS, an illness not educationally required in CAAHEP accredited programs. This case study will serve as an educational resource to further athletic trainer's knowledge of STSS.

STSS Pathogenesis, Signs and Symptoms

Group A streptococcal (GAS) is a bacterium found in the throat and on the skin causing pharyngitis, impetigo, erysipelas, necrotizing fasciitis, myositis, puerperal fever, bacterium, and some forms of scarlet and rheumatic fever (Cone et al., 1987). In severe cases, GAS causes streptococcal toxic shock or necrotizing fasciitis, known as the flesh-eating bacteria (Johnston, 1997). Necrotizing fasciitis is a severe and uncommon infection involving the deep subcutaneous tissues, including the superficial fascia, and sometimes the deep fascia (Gardam, Low, Miller & Saginur, 1998). Necrotizing fasciitis progressively destroys fascia and fat, while sparing skin and muscle (Stevens, 1995). Finally, necrotizing fasciitis is caused by several types of bacteria, specifically microaerophilic streptococci, which may develop in diabetic patients or patients with open wounds contaminated by bowel contents (Stevens).

Present cases of necrotizing fasciitis caused by GAS are associated with severe manifestations of systemic illness and high morbidity, despite the absence of underlying disease and the use of antibiotics, dialysis, ventilators, intravenous fluids, and improved surgical techniques. A possibility exists that the high mortality rate in current cases of

streptococcal necrotizing fasciitis may be due to the emergence of more virulent streptococci (Stevens, 1992).

Myositis may also occur in patients with STSS incurring necrotizing fasciitis. Although myositis is uncommon, it has a fatality rate between 80% to 100% (Stevens, 1995). Early documents state that severe pain is the only early symptom, and swelling and erythema may be the only physical findings (Adams et al., 1985).

Table 1.

Streptococcal Toxic Shock Syndrome

A. Isolation of Group A Streptococcus	B. Clinical signs of severity
1. From a sterile site	1. Hypotension
2. From a nonsterile site	1. Clinical and laboratory abnormalities: (requires two or more of the following):
	a) renal impairment
	b) coagulopathy
	c) liver abnormalities
	d) adult respiratory distress syndrome
	e) extensive tissue necrosis (necrotizing fasciitis)
	f) erythematous rash
Definite case: A1 + B (1 + 2); Probable case: A2 + B (1 + 2) (The Working Group, 1993)	

Streptococcal Toxic Shock Syndrome

A case report by Tom Perrin (2001) quoted Dennis Stevens, Chief of Infectious Diseases at the Veterans Affairs Medical Center in Boise, Idaho, and a leading authority on streptococcal toxic shock syndrome as saying, “among 150 strains of streptococcal bacteria, only 6 or 7 are closely associated with toxic shock syndrome” (p. 3). Strep bacteria usually enter the body through the skin. Persons most susceptible to

streptococcal infections resulting in toxic shock syndrome have sustained an open wound, resulting from surgery, childbirth, common accident, or chickenpox.

Numerous STSS cases develop within 24-72 hours of minor non-penetrating trauma resulting in deep bruises and muscle strains (Stevens, 1995). Persons of all ages can be affected by streptococcal toxic shock syndrome, and most do not have predisposing underlying diseases (Stevens). This statement is in sharp contrast to older reports of GAS infections in which patients were either under 10 or over 60 years of age with underlying conditions such as cancer, renal failure, leukemia, or severe burns where corticosteroids were used as treatment.

Current complications of GAS are severe, such as aggressive soft tissue infection, shock, adult respiratory distress syndrome, and renal failure. Pain is the most common initial symptom of STSS, in addition to fever (Stevens, 1995). Pain is often abrupt in onset and severity, commonly involving an extremity or mimicking pelvic inflammatory disease, pneumonia, or an acute myocardial infarction. Approximately 20% of patients have influenza-like symptoms characterized by fever, chills, nausea, vomiting, and diarrhea. Prompt diagnosis, referral, and/or treatment are necessary to decrease morbidity. Case reports and studies of STSS acquisition can aid in understanding this illness by educating sports medicine professionals of the various unique cases, diagnoses, and treatment regimens.

STSS Case Reports

Streptococcal toxic shock syndrome is an uncommon infection. This subsection focuses on independent case reports, detailing persons with the sudden onset of symptoms, diagnoses, and treatment of STSS.

Johnston (1997) described a healthy 40 year old man working in his garden who reportedly felt a sharp twinge in his chest, similar to a pulled muscle. Within a few hours he was overcome with vomiting, diarrhea, and pain. After diagnosed with STSS and necrotizing fasciitis, he underwent immediate surgical debridement of the dead tissues and was started on intravenous immunoglobulin treatment. The twinge he felt in his chest was derived as the cause, a minor non-penetrating trauma. He was released a few weeks later and full recovery was expected.

A similar incident reported by Tom Perrin (2001) described an 11 year old boy who acquired STSS. This healthy young boy was sitting on a stool brushing his teeth because his thighs were so sore he could not stand. He reportedly kept dropping his toothbrush and continued to tell his mother that it felt as if his arms were asleep. His speech was slurred and he lost consciousness. After a grueling stay in the hospital, diagnosed with STSS, he had both legs amputated. The doctors remain unclear as to how the bacteria entered his body.

Additional case reports published by Cone et al. (1987) studied the onset of STSS in two patients. Both patients were hospitalized at the same hospital between February and August, 1986. The first was a 46 year old male who was scratched on his right forearm by his German Shepherd dog, then reinjured the wound a day later. After feeling

ill, he went to the hospital where exploratory surgery was performed on his arm and Group A bacteria was found. He was diagnosed with toxic shock syndrome and only a few hours later, the patient died.

The second case reported by Cone et al. (1987) is that of a 59 year old woman who was originally thought to have septic shock. The patient was mildly obese and had cellulitis of the right ankle and foot, but neglected to seek medical attention. The day she was admitted to the hospital she was febrile, confused, and hypotensive. Only 2 hours after admission she had to be placed on ventilator support. After days of medications, she made a gradual recovery. The portal of entry for this woman was known to be cellulitis in the lower leg.

Another case of a 53 year old male presented in the emergency room with shortness of breath and palpitations (Forni et al., 1995). He had symptoms of the flu 3 days before admission to the hospital. Once admitted, his condition rapidly deteriorated over 2 hours and he was moved to the intensive care unit. A few hours later he developed a tension pneumothorax, followed by cardiac arrest. He died only 20 hours after arriving in the emergency room.

The final case covered by Forni et al. (1995) is that of a 50 year old male with pain and swelling that extended from the right thumb up the arm. He had injured the thumb on a nail four days prior to the hospital visit. The entire hand had become swollen, with pain and redness advancing to the forearm and then to the right shoulder and neck (Forni et al.). Seven hours after admission, surgery was performed on the right extremity. Once in intensive care, his condition did not improve. On day two of the

hospital stay, amputation of the right arm was necessary. He then developed progressive cellulitis that spread through the chest and abdomen leading to death.

The severity of case reports mentioned solidifies the need for education on this often potentially deadly and debilitating illness. All of the cases discussed in this section had a common link, individuals who became ill with STSS from different aspects of everyday life. To date, no case study involving an athlete has been recorded. The following studies will detail specific instances of individuals who have been diagnosed with STSS from a simple injury.

STSS Incurred From Common Injuries

Significant morbidity, especially amputation, is often associated with cases of necrotizing fasciitis complicated by streptococcal toxic shock syndrome. These discouraging outcomes were outlined in a group study performed by Stevens, Tanner, Winship, Swarts, Ries, Schlievert, Kaplan (1989). Group A streptococcal (GAS) infections in the Rocky Mountain area of the United States were specifically examined due to a sudden surge. Twenty patients; 16 under the age of 50, had a GAS infection. Only seven had predisposing factors including alcohol abuse, adult onset diabetes, obesity, IV drug users, and one patient had neurologic dysfunction due to a prior craniotomy (Stevens et al.). STSS entry portals were through the skin from items such as leg ulcers, local trauma, intravenous drug abuse, and infected hair follicles. Additional entry through mucus membranes such as the vagina and throat were noted. STSS developed after surgery in some patients and after minor trauma, such as an elbow abrasion or a small bruise in others. The most common initial symptom was pain in the

extremities or abdomen. In 19 patients, shock was apparent at the time of admission to a hospital or within hours thereafter. Six died of GAS infections indicating a similar mortality rate to other studies.

Davies, McGeer, Schwartz, Green, Cann, Simor, Low, and The Ontario Group A Streptococcal Study Group (1996), studied a large number of subjects with invasive Group A streptococcal infections between 1992 and 1993 in Ontario, Canada. During the study period, 323 cases were identified. The median age of the participants was 41 years old. The most common clinical presentations were 48% skin or soft tissue infection, 14% bacteremia, and 11% pneumonia; however, only 31 patients were classified as having streptococcal toxic shock syndrome, four were dead on arrival to the hospital, and seven died shortly after admission (Davies et al.). Individuals classified as having STSS averaged 61 years of age and were more likely to have underlying chronic illnesses. The overall mortality rate was 81% among patients with a definite case of STSS compared with the 5% among those with only a probable case.

In a similar study, Forni, Kaplan, Schlievert, and Roberts (1995) gathered data and observations of three adult patients with STSS during a 7-month period in 1990. All patients had definite cases according to the definition provided by the Working Group on Severe Streptococcal Infections (Forni et al.). First, a 36 year old male presented to the emergency department for evaluation of a painful thigh. He had injected cocaine only 3 days prior to admission to the hospital. He was ill appearing, had fever, vomiting, diarrhea, and redness and tenderness of the thigh. Only 8 hours after admission he underwent an extensive fasciotomy of the right thigh. After surgery his condition

improved demonstrating full recovery when a GAS infection is properly evaluated and diagnosed within the first few hours of symptom onset.

Pima County, Arizona served as another study site of streptococcal toxic shock syndrome. Between 1985 and 1990, several incidents of STSS were documented and researched by Hoge, Schwartz, Talkington, Breiman, MacNeil and Englander (1993). These researchers attempted to address whether STSS cases were increasing or if the number of cases being reported increased, by examining charts of all patients hospitalized with Group A streptococcal infection in 10 Pima County hospitals. Researchers found that the proportion of patients with hypotension, rash, desquamation, renal impairment, and gastrointestinal involvement increased from 0% to 15% during the years of the study (Hoge et al.). Patients with signs and symptoms of STSS tended to be younger and less likely to have underlying medical conditions than patients with uncomplicated invasive streptococcal disease. Thus persons diagnosed with STSS were healthy, young individuals. Most medical professionals do not suspect such severe illness in this population.

Most patients discussed in the studies were unaware of their illness and had severe ramifications due to the immune system and sometimes deterioration of the body. The more time taken to diagnose an individual with STSS, the more damage bacteria insights on the body. Therefore, education of all medical professionals, athletic trainers as well as physicians, may help decrease the assessment, referral, and diagnosis time, and improve chances of full recovery.

STSS Treatment

Penicillin is often used to treat streptococcal infections. Wannamaker, Rammelkamp, Denny, Brink, Houser, and Hahn (1951) demonstrated that penicillin therapy prevents the development of rheumatic fever following streptococcal pharyngitis if therapy begins within 8 to 10 days after the onset of the sore throat. Some failures of penicillin treatment do occur with streptococcal infection. Five percent to 20% of patients with streptococcal pharyngitis are immune to penicillin treatment (Stevens, 1995). More aggressive GAS infections respond less well to penicillin and continue to be associated with high mortality rates. Some STSS aggressive infections are necrotizing fasciitis, subcutaneous gangrene, and myositis. For example, 25 cases of streptococcal myositis had an overall mortality rate of 85% in spite of penicillin treatment (Stevens).

Several studies in experimental infection suggest that penicillin fails when large numbers of organisms are present (Stevens, Gibbons, Bergstrom, & Winn, 1988). So, often several drugs are administered to control the infection of STSS. Stevens et al. used a mouse model of myositis caused by Group A streptococcal bacteria and found penicillin to be ineffective when treatment was delayed up to 2 hours after infection. Survival of erythromycin-treated mice was greater than that of both penicillin-treated mice and untreated controls, but only if treatment was initiated within two hours of the onset of symptoms. Mice receiving a medicine called clindamycin had survival rates of 80% to 100%, even if treatment was delayed up to 16.5 hours after the onset of symptoms (Stevens et al.). Regardless of medicinal treatment referral must be quickly made by an ATC.

Clindamycin is frequently a part of drug therapy for patients with severe streptococcal infections. Since clindamycin inhibits protein synthesis, its efficacy is not dependent on penicillin binding proteins (American Academy of Pediatrics Committee on Infectious Diseases, 1998). In addition, clindamycin inhibits the synthesis of proteins and exotoxins and action on bacteria persists longer than that of penicillin. According to the American Academy of Pediatrics Committee on Infectious Disease, many experts recommend intravenously administered clindamycin in addition to penicillin. However, clindamycin should not be used alone for treating a severe invasive GAS infection until the isolate is determined to be sensitive to this agent (American Academy of Pediatrics Committee on Infectious Diseases). A small portion of Group A streptococcal bacterial strains are clindamycin resistant requiring a multi-medicinal approach to STSS using a combination of clindamycin and other medications. Therefore, other medications are sometimes used as alternatives.

One alternative treatment to clindamycin is intravenous immunoglobulin (IVIG). According to Lamothe, D'Amico, Ghosh, Tremblay, Braidy, and Patenaude, (1995) IVIG may be beneficial when given in addition to appropriate antimicrobial therapy for streptococcal toxic shock syndrome. Intravenous immunoglobulin is understood to work "by blocking or inactivating the exotoxins that stimulate proliferation of T lymphocytes resulting in a decrease in the production of inflammatory cytokines" (Lamothe et al.). Since cytokines have a major role in the progression of STSS, other agents such as corticosteroids, which decrease production or block activity of the cytokines, may be beneficial in the treatment of severe GAS infections. However, Lamothe et al. state that

no published controlled studies have demonstrated the effectiveness of these agents and their usefulness is not clear, so further research needs to be conducted.

Barry et al. (1992), reported a case of STSS in which intravenous immunoglobulin was administered when signs and symptoms worsened while the patient received conventional therapy. Within hours of administration of the IVIG, the patient experienced dramatic clinical improvement. Upon administration of IVIG there was rapid improvement in her respiratory status, almost complete reversal of painful vasopastic changes in her fingers caused from the conventional medicines, and cessation of accumulation of diffuse subcutaneous edema. She was discharged one week later on oral amoxicillin.

In a similar case report by Johnston (1997), following surgery to remove the dead tissue from a 40 year old man's body, intravenous immunoglobulin was administered. Johnston describes IVIG as "an immune-system booster—a cocktail of antibodies pooled from thousands of blood donations across North America—gave this man the ability to overcome the devastating toxins the bacteria had let loose" (p. 46). This man was discharged a few weeks later with full recovery expected.

Johnston (1997) reported that enzymes enable the organism to spread by dissolving surrounding tissue. Other toxins released by bacteria actually trick the immune system to turn against itself. IVIG works by neutralizing the invading toxins that cause the immune system to overreact (Johnston).

Information concerning the medications that may be used to treat STSS is not concrete. Penicillin has been used for many years and continues to be effective.

However, with more than one organism disrupting the immune system, clindamycin should be used, especially in cases of streptococcal toxic shock syndrome. Newer therapies such as intravenous immunoglobulin therapy has been used in several cases of STSS and proves to be extremely effective, but scientific studies supporting this theory are limited. More research needs to be conducted to determine successful STSS treatment.

Dissemination Of Group A Streptococcal Infections

Although cases of STSS tend to be sporadic, reports of GAS spreading from one person to another have occurred in a nursing home, military base, or family setting. Spreading of the infection has not been clarified as either airborne or touch. Despite a few occurrences, the risk of invasive disease in household contacts of patients with invasive streptococcal disease is only 2.9 per 1,000 cases, and the likelihood of secondary STSS is even lower (Holm et al., 1992).

Schwartz, et al. (1992) described specific instances where clusters of invasive GAS were located in families, hospitals, and nursing home settings. The spread of GAS infections from colonized healthcare personnel to patients, especially in surgical or gynecologic settings, is well recognized (Schwartz et al.). This first cluster of invasive GAS discussed was classified as a family cluster in 1990. A college student tested positive for GAS before going home for Thanksgiving holiday. A week after the student returned to school, the father experienced perianal burning and redness and pustular lesions on his fingers and hands. A few days later the student's mother noted the onset of vaginal discharge. She had vomiting, diarrhea, fever, and chills. After examination, the

isolation of GAS from the mother's blood, the lesions on the father's hands, and the student's throat were related (Schwartz et al.). All were placed on the proper medications and conditions improved.

Clustering has also occurred in a hospital's intensive care unit. An 84 year old man was admitted with a one day history of rapidly progressing facial swelling, positive for GAS, and died a week later. The nurse that tended to him developed a sore throat and fever the following day. She was also positive for GAS. Another nurse who cared for the patient on another shift, developed a sore throat and fever, and approximately two days later tested positive for GAS (Schwartz et al., 1992). Yet another patient that was in the ICU at the same time as the 84 year old male, was situated two beds away from him and developed a sore throat and fever as well. Once the cluster was identified, respiratory isolation of infected patients was instituted (Schwartz et al.).

The last cluster noted by Schwartz et al. (1992) was in a nursing home. The Alzheimer's Disease Unit is a 14-bed, locked facility located in a skilled nursing home. On December 25, 1990, a 90 year old man became lethargic and feverish. He had a rash on his leg and was transferred to the hospital where he died later that day. Following this incident, three other patients became ill with GAS infections. No known cause of GAS spreading was noted in the study. All infected residents had separate rooms, and uninfected roommates. The patients were in close contact, but nothing unusual. Schwartz et al. did note that not a single staff member was evidenced as being responsible for transmitting infection to the residents.

DiPersio et al. (1996) conducted a similar study demonstrating that Group A streptococcus is a highly transmissible microorganism, an observation that is supported by epidemiological studies of different types of GAS infection including scarlet fever, pharyngitis, rheumatic fever, and impetigo. Conclusions from DiPersio's study demonstrated that a strain of GAS may cause different diseases in different hosts, such as necrotizing fasciitis, pharyngitis, or scarlet fever.

Although clusters have been identified, STSS is believed to be non-contagious. Only Group A streptococci bacteria can be transmitted from one person to another. STSS occurrence in families, hospitals, or nursing homes from one infected index patient is highly unlikely. Bacterium that causes strep throat is highly contagious and should be treated immediately. An individual with symptoms of strep throat should always be treated without delay because the bacteria may lead to a more serious infection or the individual may be in the beginning stages of STSS.

Summary

Sports medicine personnel must be well trained in clinical evaluation techniques to properly assess and refer illnesses. Knowledge of the unique signs and symptoms, or a combination thereof, is of utmost importance for accurate and prompt referral. Referral of the ill athlete to a physician should not be delayed when a combination of symptoms leading to STSS is suspected. STSS often has a rapid onset while signs and symptoms quickly progress resulting in the deterioration of organs and tissues, shock, surgeries, and even death. Treatment protocols should be under the direct care of physicians with

proper medicinal therapies. Complications may be severe; therefore delay of evaluation should be eliminated.

Sports medicine professionals including athletic trainers need to be educated on STSS and other uncommon illnesses that affect young populations. This need is due to the high mortality rate with incidents of STSS. Thus, the purpose of this study is to aid in the educational process of athletic trainers to better evaluate and properly refer athletes with suspected Group A infections which may lead to the onset of STSS.

Chapter 3

METHODS

Athletic trainers are the first health care provider athletes often encounter. Thus assessing streptococcal toxic shock syndrome (STSS), a potentially deadly infection, is essential. The purpose of this proposal was to present a case study in order to educate certified athletic trainers and other medical professionals about the signs, symptoms, and severity of STSS, in reference to common misdiagnoses of strep throat or influenza. Education in the form of a case study will aid in informing athletic trainers of STSS, which is not currently an educational requirement by the National Athletic Trainers' Association. In addition, this case study will be the first article detailing a competitive athlete with STSS. In this chapter, the methodology of writing a case study will be discussed in four sections: 1) research design, 2) participant, 3) procedure, and 4) project completion.

Research Design

In order to develop a case study, several aspects must be considered. The development of the research question may be the most difficult aspect, involving the identification of a unique situation or individual and then researching and analyzing all data collected. This case study focused on one participant who was stricken with a unique illness which usually results in death. The rarity of this incident, especially in athletics, and need for education in sports medicine support the design choice. Case studies are designed to center on one particular situation and then educate others about relevant information. An objective of this case study was to provide relevant data as an

important reference for the education of ATCs and sports medicine professionals.

Reference to this case study may allow health care professionals to respond to similar situations with expediency and proper medical care.

Participant

The participant in this study was a 21 year old, female athlete at the NCAA Division 1 level involved in track and field who was struck with STSS during her senior season. She is a European American with no previous serious medical history other than chronic knee pain occasionally controlled by Ibuprofen and under physician care.

Procedure

This case study will involves descriptive research methods. A thorough review of articles on Group A STSS obtained from journals and other primary sources served as background information. Once the Human Subjects-Institutional Review Board granted approval for this study, the participant was given an introductory letter detailing the researcher and study, confidentiality, and a request for release of medical records and a release waiver stating that medical records may be copied (see Appendix B). The signed release waiver was taken to the records department of the hospital that treated the participant through the duration of the illness to obtain the proper records from appropriate medical professionals. At that time a copy of the records was released to the researcher. X-rays, surgery reports, medications, vitals, and daily updates by physicians and medical staff involved in the participants case comprised medical records collected and analyzed for this study.

Review of the literature collected was analyzed in detail to better understand the illness and treatments involved. The review of research covered Group A streptococci bacteria, similar documented cases, STSS pathogenesis, and treatments. Lexis Nexus and Medline Internet Explorer were used to find information on STSS and documented cases. Research was derived from medical journals such as, but not limited to: *The Journal of American Medical Association*, *The New England Journal of Medicine*, *American Family Physician*, *Clinical Infectious Diseases*, *Archives of Internal Medicine* and *The Journal of Infectious Diseases*.

A timeline of events based on medical records and interviews was constructed in order to analyze and discuss the case. Once the researcher has summarized the medical records, the summary was returned to the source (athlete) to review and clarify any misconceptions, otherwise known as member checking. A reflexive journal was kept by the researcher detailing corrections of data and rationale for changes, meetings with medical professionals or committee members, and phone conversations to track the evaluation and completion of this project. Peer debriefing was also used throughout the case study writing process. The completed case study was given to two persons who are not involved in sports medicine and another graduate student (certified athletic trainer). Peer debriefing was used to verify clarity of material and readability of the case study. Additionally, the research involved triangulation, which is asking another individual who has years of experience to check and analyze the case and verify themes and assessments. The individual involved with this process is a certified athletic trainer, with 14 years of experience and a terminal degree.

Project Completion

This particular athlete and the severe case of STSS are a unique and rare problem that athletic trainers should understand for evaluative purposes. This case study is intended to be educational to all sports medicine professionals. Information on this current case study will be compiled into a journal article. The finished case study article will be submitted for publication to the *Journal of Athletic Training* based on the *Author's Guide* (see Appendix A).

REFERENCES

- Adams, E.M., Gudmundsson, S., Yocum, D.E., Haselby, R.C., Craig, W.A., & Sundstrom, W.R. (1985). Streptococcal myositis. *Archives of Internal Medicine*, 145, 1020-1023.
- American Academy of Pediatrics Committee on Infectious Diseases (1998). Severe invasive group A streptococcal infections: a subject review. *Pediatrics*, 101 (1), 136-141.
- Anderson, M.K., & Hall, S.J. (1995). *Sports injury management*. Media, PA: Williams and Wilkins.
- Barry, W., Hudgins, L., Donta, S.T., & Pesanti, E.L. (1992). Intravenous Immunoglobulin therapy for toxic shock syndrome. *The Journal of the American Medical Association*, 267, 3315-3316.
- Centers for Disease Control and Prevention (1993). CDC defines group A streptococcal toxic shock syndrome. *American Family Physician*, 47, 1643-1645.
- Cone, L.A., Woodard, D.R., Schlievert, P.M., & Tomory, G.S. (1987). Clinical and bacteriologic observations of a toxic shock-like syndrome due to streptococcus pyogenes. *The New England Journal of Medicine*, 317 (3), 146-149.
- Davies, H.D., McGreer, A., Schwartz, B., Green, K., Cann, D., Simor, A.E., Low, D.E. & The Ontario Group A Streptococcal Study Group (1996). Invasive group A streptococcal infections in Ontario, Canada. *The New England Journal of Medicine*, 335 (8), 547-554.

- DiPersio, J.R., File, T.M., Stevens, D.L., Gardner, W.G., Petropoulos, G., & Dinsa, K. (1996). Spread of serious disease-producing M3 clones of group A streptococcus among family members and health care workers. *Clinical Infectious Diseases*, 22, 490-495.
- Forni, A.L., Kaplan, E.L., Schlievert, P.M., & Roberts, R.B. (1995). Clinical and microbiological characteristics of severe group A streptococcus infections and streptococcal toxic shock syndrome. *Clinical Infectious Diseases*, 21, 333-340.
- Fraulin, F.O.G., Giuffre, M.J., Campbell, D.D., Lobay, G.W., & Edwards, D.C. (1995). Invasive group A streptococcal soft tissue infection and the streptococcal toxic shock like syndrome. *The Canadian Journal of Plastic Surgery*, 3 (1), 30-34.
- Gardam, M.A., Low, D.E., Saginur, R., & Miller, M.A. (1998). Group B streptococcal necrotizing fasciitis and streptococcal toxic shock-like syndrome in adults. *Archives of Internal Medicine*, 158, 1704-1709.
- Gray, B.M., Evans, A.S., & Brachman, P.S. (1991). *Bacterial infections of humans: epidemiology and control, second edition*. New York: Plenum.
- Gregory, T. (1998). Scarlet fever and its relatives. *Patient Care*, 32 (11), 109-110.
- Hoge, C.W., Schwartz, B., Talkington, D.F., Breiman, R.F., MacNeil, E.M., & Englander, S.J. (1993). The changing epidemiology of invasive group A streptococcal infections and the emergence of streptococcal toxic shock-like syndrome. *The Journal of the American Medical Association*, 269 (3), 384-389.

- Holm, S.E., Norrby, A., Bergholm, A., & Norgren, M. (1992). Aspects of pathogenesis of serious group A streptococcal infections in Sweden 1988-1989. *The Journal of Infectious Diseases*, 166, 31-37.
- Johnston, N. (1997). Surviving the horror: A cocktail of antibodies helps patients overpower flesh-eating disease. *Maclean's*, 110 (32), 46-48.
- Lamothe, F., D'Amico, P., Ghosn, P., Tremblay, C., Braidy, J., & Patenaude, J.V. (1995). Clinical usefulness of intravenous human immunoglobulins in invasive group A streptococcal infections: case report and review. *Clinical Infectious Diseases*, 21, 1469-1470.
- Merriam, S.B. (1988). *Case study research in education: A qualitative approach*. San Francisco: Jossey-Bass.
- National Athletic Trainers' Association Athletic Training Educational Competencies. (1999). Dallas, TX.
- Patlak, M. (1991). Strep demands immediate care. *FDA Consumer*, 25 (8), 24-26.
- Perrin, T. (2001, January 18). Children contract a rare illness: Three hospitalized with toxic shock. *Kansas City Star*, p. A1. [ProQuest.]
- Schwartz, B., Elliot, J.A., Butler, J.C., Simon, P.A., Jameson, B.L., Welch, G.E., & Facklam, R. (1992). Clusters of invasive group A streptococcal infections in family, hospital, and nursing home settings. *Clinical Infectious Diseases*, 15, 277-284.
- Stake, R.E. (1995). *The art of case study research*. Thousand Oaks, CA: Sage.
- Stevens, D.L. (1992). Invasive group A streptococcus infections. *Clinical Infectious*

Disease, 14, 2-13.

Stevens, D.L. (1995). Streptococcal toxic-shock syndrome: Spectrum of disease, pathogenesis, and new concepts in treatment. *Emerging Infectious Diseases, 1* (3), 78-91.

Stevens, D.L., Gibbons, A.E., Bergstrom, R., & Winn, V. (1988). The Eagle effect revisited: Efficacy of clindamycin, erythromycin, and penicillin in the treatment of streptococcal myositis. *The Journal of Infectious Diseases, 158*, 23-28.

Stevens, D.L., Tanner, M.H., Winship, J., Swarts, R., Ries, K.M., Schlievert, P.M., Kaplan, E. (1989). Severe group A streptococcal infections associated with a toxic shock-like syndrome and scarlet fever toxin A. *The New England Journal of Medicine, 321* (1), 1-7.

Strausbaugh, L.J. (1997). Emerging infectious diseases: A challenge to all. *American Family Physician, 55* (11), 111-118.

Thomas, C.L. (1993). *Taber's cyclopedic medical dictionary*. Philadelphia: F.A. Davis.

Utah Department of Health. (1998). Streptococcal toxic shock syndrome. *Bureau of Epidemiology*. Retrieved April 18, 2001, from the World Wide Web:
<http://hlunix.hl.state.ut.us/els/epidemiology/epifacts.html>

Wannamaker, L.W., Rammelkamp, C.H., Denny, F.W., Brink, W.R., Houser, H.B., & Hahn, E.O. (1951). Prophylaxis of acute rheumatic fever by treatment of the preceding streptococcal infection with various amounts of depot penicillin. *American Journal of Medicine, 10*, 673-695.

The Working Group on Severe Streptococcal Infections (1993). Defining the group A

streptococcal toxic shock syndrome: rationale and consensus definition. *The Journal of the American Medical Association*, 269 (3), 390-392.

Appendix A

***Journal of Athletic Training* (2001) Guidelines for publication**

Authors' Guide

(Revised January 2001)

The mission of the *Journal of Athletic Training* is to enhance communication among professionals interested in the quality of health care for the physically active through education and research in prevention, evaluation, management, and rehabilitation of injuries.

SUBMISSION POLICIES

1. Submit 5 copies of the entire manuscript (including tables and figures) to *Journal of Athletic Training* Submissions, Hughston Sports Medicine Foundation, Inc., 6202 Veterans Parkway, PO Box 9517, Columbus, GA 31906-0517. The term "figure" refers to items that are not editable: either halftones, photographs or line art, charts, graphs, tracings, schematic drawings, or combinations of the two. A table is an editable item that needs to be typeset.
2. All manuscripts must be accompanied by a letter signed by each author and must contain the following statements: "This manuscript 1) contains original unpublished material that has been submitted solely to the *Journal of Athletic Training*; 2) is not under simultaneous review by any other publication; and 3) will not be submitted elsewhere until a decision has been made concerning its suitability for publication by the *Journal of Athletic Training*. In consideration of the NATA's taking action in reviewing and editing my submission, I the undersigned author hereby transfer, assign, or otherwise convey all copyright ownership to the NATA, in the event that such work is published by the NATA. Further, I verify that I have contributed substantially to this manuscript as outlined in item #3 of the current Authors' Guide." By signing the letter, the author agrees to comply with all statements. Manuscripts that are not accompanied by such a letter will not be reviewed. Accepted manuscripts become the property of the NATA. Authors agree to accept any minor corrections of the manuscript made by the editor.
3. Beginning with volume 36, the contribution of each author will be specifically identified in the published manuscript, in accordance with the Uniform Requirements for Manuscripts Submitted to Biomedical Journals. "Authorship credit should be based only on 1) substantial contributions to conception and design, or acquisition of data, or analysis and interpretation of data; 2) drafting the article or revising it critically for important intellectual content; and 3) final approval of the version to be published. Conditions 1, 2, and 3 must all be met. Acquisition of funding, the collection of data, or general supervision of the research group, by themselves, do not constitute authorship." For additional information, please visit the Uniform Requirements website: <http://www.icmje.org/index.html>. The authorship form, which is available at <http://www.journalofathletictraining.org>, should be completed and submitted with each new manuscript. Contribution categories include conception and design, acquisition of data, analysis and interpretation of the data, drafting of the article, critical revision of the article for important intellectual content, final approval of the article, provision of study materials or patients, statistical expertise, obtaining of funding, administrative, technical, or logistic support, and collection and assembly of data. (Categories borrowed with the permission of the *Annals of Internal Medicine*.) Contributors to the manuscript who do not qualify

for authorship should be thanked in the Acknowledgments section.

4. Financial support or provision of supplies used in the study must be acknowledged. Grant or contract numbers should be included whenever possible. The complete name of the funding institution or agency should be given, along with the city and state in which it is located. If individual authors were the recipients of funds, their names should be listed parenthetically.
5. Authors must specify whether they have any commercial or proprietary interest in any device, equipment, instrument, or drug that is the subject of the article in question. Authors must also reveal if they have any financial interest as a consultant, reviewer, or evaluator in a drug or device described in the article.
6. For experimental investigations of human or animal subjects, state in the Methods section of the manuscript that an appropriate institutional review board approved the project. For those investigators who do not have formal ethics review committees (institutional or regional), the principles outlined in the Declaration of Helsinki should be followed. At the World Medical Assembly Declaration of Helsinki, recommendations guiding physicians in biomedical research involving human subjects. *Bull. Pan Am Health Organ*. 1990;24:606-619. For investigations of human subjects, state in the Methods section the manner in which informed consent was obtained from the subjects. (Reprinted with permission of JAMA 1997;278:68, copyright 1997, American Medical Association.)
7. Signed releases are required to verify permission for the *Journal of Athletic Training* to 1) reproduce materials taken from other sources, including text, figures, or tables; 2) reproduce photographs of individuals; and 3) publish a Case Report. A Case Report cannot be reviewed without a release signed by the individual being discussed in the Case Report. Release forms can be obtained from the Editorial Office and from the JAT web page, or authors may use their own forms.
8. The *Journal of Athletic Training* uses a double-blind review process. Authors should not be identified in any way except on the title page.
9. Manuscripts are edited to improve the effectiveness of communication between author and readers and to aid the author in preventing a work that is incompatible with the style policies found in the *AMA Manual of Style*, 9th ed. (Williams & Wilkins), 1998. Page proofs are sent to the author for proofreading when the article is typeset for publication. It is important that they be returned within 48 hours. Important changes are permitted, but authors will be charged for excessive alterations.
10. Published manuscripts and accompanying work cannot be returned. Unused manuscripts will be returned if submitted with a stamped, self-addressed envelope.

STYLE POLICIES

1. Each page must be printed on 1 side of 8 1/2-by-11-inch paper, double spaced, with 1-inch margins in a font no smaller than 10 points. Each page should include line counts to facilitate the review process. Do not right justify pages.
2. Manuscripts should contain the following, organized in the order listed below, with each section beginning on a separate page.
  - a. Title page

- b. Acknowledgments
- c. Abstract and Key Words (first numbered page)
- d. Text (body of manuscript)
- e. References
- f. Tables (each on a separate page)
- g. Legends to figures
- h. Figures
13. Begin numbering the pages of your manuscript with the abstract page as #1, then consecutively number all successive pages.
14. Units of measurement shall be recorded as SI units as specified in the *AMA Manual of Style*, except for angular displacement, which should be measured in degrees rather than radians. Examples include mass in kilograms (kg), height in centimeters (cm), velocity in meters per second (m/s) or miles, angular velocity in degrees per second (°/s), force in Newtons (N), and complex rates (miles per minute).
15. Titles should be brief within descriptive limits (a 10-word maximum is recommended). If a disability is the relevant factor in an article, the name of the disability should be included in the title. If a technique is the principal reason for the report, it should be in the title. Often both should appear.
16. The title page should also include the name, title, and affiliation of each author, and the name, address, phone number, fax number, and e-mail address of the author to whom correspondence is to be directed. No more than 3 credentials should be listed for each author.
17. A structured abstract of no more than 250 words must accompany all manuscripts. Type the complete title (but not the authors' names) at the top, skip 2 lines, and begin the abstract. Items that are needed differ by type of article: Literature Reviews: Objective, Data Sources, Data Synthesis, Conclusions/Recommendations, and Key Words; Original Research articles: Objective, Design and Setting, Subjects, Measurements, Results, Conclusions, and Key Words; Case Reports: Objective, Background, Differential Diagnosis, Treatment, Uniqueness, Conclusions, and Key Words; Clinical Techniques: Objective, Background, Description, Clinical Advantages, and Key Words. For the Key Words entry, use 3 to 5 words that do not appear in the title.
18. Begin the text of the manuscript with an introductory paragraph or two in which the purpose or hypothesis of the article is clearly stated and developed. Tell why the study needed to be done or the article written and end with a statement of the problem (or controversy). Highlights of the most prominent works or others as related to your subject are often appropriate for the introduction, but a detailed review of the literature should be reserved for the discussion section. In a 1- to 2-paragraph review of the literature, identify and develop the magnitude and significance of the controversy, pointing out differences among others' results, conclusions, and/or opinions. The introduction is not the place for great detail; state the facts in brief, specific statements and reference them. The detail belongs in the discussion. Also, an overview of the manuscript is part of the abstract, not the introduction. Writing should be in the active voice (for example, instead of "Subjects were selected," use "We selected subjects") and in the first person (for example, instead of "The results of this study showed," use "Our results showed").
19. The body or main part of the manuscript varies

Appendix B

Consent To Participate In Study Forms

San José State
UNIVERSITY

**College of Applied
Sciences and Arts
Department of Human
Performance**

One Washington Square
San Jose, CA 95128-0004
Voice: (408) 924-3077
Fax: (408) 924-4132

Agreement to Participate in Research

Responsible Investigator: Cindy Fields

**Title of Protocol: Rare Bacterial Infection in a Collegiate Athlete:
A Case Report**

1. I have been asked to participate in a research study investigating an illness I incurred while participating in track and field at the collegiate level. The illness that the research study will focus on is Streptococcal Toxic Shock Syndrome.
2. I grant the investigator access to all medical records related to Streptococcal Toxic Shock Syndrome. The medical records will be kept secure at the researchers home. All information that would reveal my identity including, name and date of birth, will be removed from the medical records before storage. The consent form and medical records will remain separated and under lock and key.
3. No risks are anticipated and no benefits are expected.
4. There will be no compensation awarded for participation.
5. The results of the study may be published but no information that could identify me will be included.
6. Any questions about the research may be addressed to Cindy Fields at (408) 993-0804. Complaints about the research may be presented to Greg Payne, Ph.D., Chair, Human Performance Department, at (408) 924-3028. Questions about the research, subjects' rights, or research-related injury may be presented to Nabil Ibrahim, Ph.D., Associate Vice President for Graduate Studies and Research, at (408) 924-2480.
7. I voluntarily give consent to participate in this study. I may refuse to participate in the study or in any part of the study. I am free to withdraw at any time without prejudice to my relations with San Jose State University and I will not lose any services in which I am entitled.
8. I have received a signed and dated copy of the consent form.

_____
Signature

_____
Date

_____
Investigator's Signature

_____
Date

The California State University
System
San Jose State University
College of Applied Sciences and Arts
Department of Human Performance
One Washington Square
San Jose, CA 95128-0004
Voice: (408) 924-3077
Fax: (408) 924-4132

San José State
UNIVERSITY

**College of Applied
Sciences and Arts
Department of Human
Performance**

One Washington Square
San Jose, CA 95192-0054
Voice: 415-924-8010
Fax: 415-924-1057

Researcher's Letter

Date: xx/xx/xx
To: XXXXXX XXXXXXXX, Participant
Cc: Medical Professionals

From: Cindy Fields

I am a graduate student in the Human Performance Department at San Jose State University. I would like to detail a case study regarding your bout with Streptococcal Toxic Shock Syndrome (STSS) in 2001 while you were a collegiate track and field athlete. As you know, this illness is rare and has a high mortality could be an educational tool for other athletic trainers in an attempt to limit the occurrence in other athletes. The intent of this case study is to submit an article for publication in the *Journal of Athletic Training*, an educational journal for the sports medicine professionals, specifically athletic trainers.

In addition, please sign the enclosed medical record release, which will be mailed to hospitals, and physicians that you encountered during your STSS illness. Your signature on the medical record release will allow me access to copies of your medical records for the sole process of writing the case study. All names will remain confidential.

Sincerely,

Cindy Fields

One Washington Square
San Jose, CA 95128-0154
Voice 408/924-8070
Fax 408/924-8050

Date: xx/xx/xx
To: Medical Records
Xxxxxx Hospital

From: **Xxxxxx Xxxxxxxxxx**
SSN: _____
DOB: _____
Student ID: _____

I, XXXXXX XXXXXXXX, give XXXXXX Hospital the right to release a copy of my entire medical file, from February 2001 to present, related to my bout with Streptococcal Toxic Shock Syndrome (STSS) to Cindy Fields. Please include, but do not limit to, doctor reports, ER reports, operative reports, X-rays, and daily notes.

**Please mail them to :   Cindy Fields
950 Willowleaf Drive #2007
San Jose, CA 95128**

If you have any questions please do not hesitate to call 408-993-0804. Thank you for your assistance and prompt attention to this request.

Sincerely,

Xxxxxx Xxxxxxxxx

Appendix C
1999 NATA Competency Guide

Athletic Training Clinical Proficiencies

NATA EDUCATION COUNCIL

© 1999 National Athletic Trainers' Association

INTRODUCTION

The Athletic Training Clinical Proficiencies describe the expected outcomes of students who complete a CAAHEP-accredited athletic training program. The tasks delineated in this document reflect the cognitive, psychomotor, and affective competencies identified in the *Athletic Training Educational Competencies* (ed 3).

The Clinical Proficiencies, also included in the *Athletic Training Educational Competencies* (ed 3), are being released as a guide to students, instructors, and clinical instructors. Readers should keep in mind that the educational competencies guide course structure and content while the NATA Board of Certification, Inc. is used to construct the certification examination as an entry-level athletic trainer. Relevant contact information is presented at the end of this introductory section.

The Clinical Proficiencies serve two purposes: (1) They define the common set of skills that entry level athletic trainers should possess and (2) They define the expectations of an outcomes-based clinical education system. Although each of the clinical proficiencies is presented individually, the user should recognize that each is a component of a larger systematic process.

The Clinical Proficiencies only describe the clinical aspects of educational pedagogy. Using a modification of the medical model, the Clinical Proficiencies must be used concurrently with the cognitive, psychomotor, and affective competencies. Thus, the Competencies will describe the symptoms, evaluation/assessment, differential techniques, and the treatment prognosis required for the health care of athletes and others involved in similar physical activity.

Athletic training education occurs in 12 major Subject Areas:

- ❑ Risk Management and Injury Prevention
- ❑ Pathology of Injuries and Illnesses
- ❑ Assessment and Evaluation
- ❑ Acute Care of Injury and Illness
- ❑ Pharmacology
- ❑ Therapeutic Modalities
- ❑ Therapeutic Exercise
- ❑ General Medical Conditions and Disabilities
- ❑ Nutritional Aspects of Injury and Illness
- ❑ Psychosocial Intervention and Referral
- ❑ Health Care Administration
- ❑ Professional Development and Responsibilities

Each Subject Area has corresponding clinical proficiencies with the exception of Pathology of Injury and Illness, whose competencies are addressed in other Subject Areas.

ORGANIZATION ADDRESSES

CAAHEP

35 East Wacker Drive
Suite 1970
Chicago, IL 60601-2208
(v) 312.553.9355
(f) 312. 553.9616
(e) caahep@caahep.org
www.caahep.org

JRC-AT

7108-C South Alton Way
Englewood, CO 80112-2106
(v) 303.779.4853
(f) 303.741.3655
www.cewl.com

NATA, Inc.

2952 Stemmons Freeway
Dallas, TX 75247-6196
(v) 800.879.6282
(f) 214.637.2206
www.nata.org

NATA Board of Certification, Inc.

1512 South 60th Street
Omaha, NE 68106
(v) 402.559.0091
(f) 402.561.0598
(e) staff@nataboc.org
www.nataboc.org

NATA Education Council

304 Dockser Hall
Northeastern University
Boston, MA 02115
(v) 617.373.5795
(f) 617.373.5920
(e) nataec@nata.org
www.cewl.com

Risk Management and Injury Prevention

Teaching Objective 1:

The student will perform anthropometric measurement techniques and other appropriate examination and screening procedures.

Specific Outcomes

1. The student will assess the following:
  - a. height
  - b. weight
  - c. blood pressure
  - d. pulse
  - e. limb girth
  - f. limb length
  - g. vision using a Snellen eye chart
  - h. body composition, using a manual skinfold caliper and appropriate formulas

Teaching Objective 2:

The student will perform fitness tests and record and interpret the data using accepted procedures and equipment.

Specific Outcome

1. The student will demonstrate the ability to perform and evaluate the results of the following tests:
  - a. flexibility tests
  - b. strength (repetition) testing
  - c. agility tests
  - d. speed tests

Teaching Objective 3:

The student will demonstrate the ability to 1) obtain and interpret environmental data, 2) recognize potential hazardous conditions and situations in the activity setting, and 3) make the appropriate recommendations for activity.

Specific Outcomes

1. The student will
  - a. use a sling psychrometer
  - b. use a wet bulb globe index
  - c. interpret and present environmental data for the following conditions: heat; wind; humidity; potential for lightning strike; cold; poor air quality
  - d. check an activity setting for physical and/or environmental hazards
  - e. use and interpret weight charts

Teaching Objective 5:

The student will demonstrate the ability to select and fit standard protective equipment that provides safe and healthy participation in physical activity.

Specific Outcomes

1. The student will select and fit the following protective equipment:
  - a. protective helmet and head gear
  - b. protective shoulder pads
  - c. footwear for physical activity
  - d. mouth guard
  - e. rib brace/guard
  - f. prophylactic ankle brace
  - g. prophylactic knee brace

Teaching Objective 6:

The student will operate and instruct the use of isometric, isotonic, and isokinetic weight training equipment.

Specific Outcomes

1. The student will demonstrate the ability to establish repetition maximum tests.
2. The student will demonstrate the ability to perform an isokinetic test for the knee and shoulder.

3. The student will demonstrate the ability to interpret data obtained from isokinetic testing and to use this information to determine appropriate follow-up care.
4. The student will perform isometric tests for the following parts of the body:

a. ankle	e. shoulder
b. foot/toes	f. elbow
c. knee	g. wrist
d. hip	h. hand/fingers
e. trunk/torso	
5. The student will perform the following tests:

a. upper body strength test	d. lower body power test
b. lower body strength test	e. upper body muscular endurance test
c. upper body power test	f. lower body muscular endurance test

Teaching Objective 7:

The student will instruct and demonstrate for the client specific flexibility exercises and activities.

Specific Outcome

1. The student will select range-of-motion exercises and activities for all major muscle groups and their associated joints and instruct a client to perform these exercises. The exercises must include the following body regions and joints:

a. cervical region	g. hip and pelvis
b. shoulder: joint and girdle	h. knee
c. elbow	i. leg
d. wrist	j. ankle
e. hand and fingers	k. foot and toes
f. lumbar region	

Teaching Objective 8:

The student will demonstrate the ability to instruct and establish a safe environment for the use of strength and conditioning equipment.

Specific Outcomes

1. The student will demonstrate the proper lifting technique for the following exercises:

a. parallel squat	g. arm curl
b. heel raises	h. triceps extension
c. power clean	i. knee curl (flexion)
d. bench press	j. knee extension
e. shoulder press	k. leg press
f. dead lift	
2. The student will demonstrate the proper spotting technique for the following exercises:

a. parallel squat	d. bench press
b. shoulder press	e. power clean
c. dead lift	

Teaching Objective 9:

The student will demonstrate the ability to construct custom protective devices. These devices include, but are not limited to, those that protect contusions, sprains, strains, wounds, and fractures from further injury.

Specific Outcomes

1. The student will construct, apply, and remove the following protective devices:

a. bony prominence pad	e. friction pad ("doughnut" pad)
b. muscle contusion pad	f. checkrein device
c. soft playing cast (e.g., silicone, thermofoam)	
d. hard, immobilization splint or cast (e.g., thermoplastic, plaster, fiberglass)	

Teaching Objective 10:

The student will demonstrate the ability to select and apply preventative and protective taping, wrapping, splinting, bracing, and rehabilitative devices in order to prevent further injury.

Specific Outcomes

1. The student will demonstrate the ability to tape, splint, wrap, pad or brace the following joints to limit motions:
  - a. cervical spine
  - b. shoulder joint and girdle
  - c. elbow
  - d. wrist
  - e. hand and fingers
  - f. lumbar spine
  - g. hip and pelvis
  - h. knee
  - i. leg
  - j. ankle
  - k. foot and toes

Assessment and Evaluation

Teaching Objective 1:

The student will conduct static and postural evaluation and screening procedures.

Specific Outcomes

1. The student will recognize the following postural deviations and predisposing conditions:
  - a. kyphosis
  - b. lordosis
  - c. scoliosis
  - d. pelvic obliquity
  - e. tibial torsion
  - f. hip anteversion and retroversion
  - g. genu valgum, varum, and recurvatum
  - h. rearfoot valgus and varus
  - i. forefoot valgus and varus
  - j. pes cavus and planus
  - k. foot and toe posture
2. The student will perform a postural assessment of the following:
  - a. cervical spine and head
  - b. shoulder
  - c. lumbo-thoracic region
  - d. hip and pelvis
  - e. knee
  - f. ankle, foot, and toes
3. The student will identify and classify body types as
  - a. endomorph
  - b. ectomorph
  - c. mesomorph

Teaching Objective 2:

The student will perform record keeping skills while maintaining patient confidentiality.

Specific Outcomes

1. The student will
  - a. use standardized record keeping methods (e.g., SOAP, HIPS, HOPS)
  - b. select and use injury, rehabilitation, referral, and insurance documentation
  - c. use progress notes

Injury Evaluation and Physical Examination Skills

Teaching Objective 3:

The student will demonstrate the ability to palpate anatomical structures.

Specific Outcomes

1. The student will identify and palpate the following:
  - a. bony landmarks of the head, trunk, spine, scapula, and extremities
  - b. soft tissue structures of the head, trunk, spine, and extremities
  - c. abdominal and thoracic structures
  - d. primary neurological and circulatory structures

Teaching Objective 4:

The student will assess neurological responses.

Specific Outcomes

1. The student will identify and assess the following:
  - a. cranial nerves
  - b. dermatomes
  - c. myotomes
  - d. deep tendon reflexes
  - e. pathological reflexes

Teaching Objective 5:

The student will perform proper clinical evaluation techniques, including range-of-motion testing (active, passive, assisted).

Specific Outcomes

1. The student will qualitatively assess active, passive, resistive range of motion for the following:
  - a. temporomandibular joint
  - b. cervical spine
  - c. shoulder
  - d. elbow
  - e. wrist and hand
  - f. thumb and fingers
  - g. hip
  - h. lumbar spine
  - i. thoracic spine
  - j. knee
  - k. ankle
  - l. foot and toes

Teaching Objective 6:

The student will perform clinical evaluations of major body areas to assess and interpret for injury and illness.

Head and Face Evaluation

The student will

1. obtain the medical history of an ill or injured athlete or other physically active individual.
2. observe and identify the clinical signs and symptoms associated with head injury:
  - a. amnesia (retrograde or post-traumatic)
  - b. levels of consciousness
  - c. orientation (person, time, place orientation)
  - d. intracranial hematoma
  - e. balance and coordination
  - f. pupil and eye movements
  - g. pulse
  - h. blood pressure
  - i. facial postures
3. observe and identify the clinical signs and symptoms associated with eye injuries and illnesses:
  - a. orbital blowout fracture
  - b. conjunctivitis
  - c. corneal abrasion
  - d. corneal laceration
  - e. detached retina
  - f. hyphema
  - g. styne
4. observe and identify the clinical signs and symptoms associated with an ear injury or illness:
  - a. pinna hematoma ("cauliflower ear")
  - b. impacted cerumen
  - c. otitis externa
  - d. otitis media
5. observe and identify the clinical signs and symptoms associated with nose injury:
  - a. deviated septum
  - b. epistaxis
  - c. nasal fracture
6. observe and identify the clinical signs and symptoms associated with jaw, mouth, or tooth injury or illness:
  - a. gingivitis
  - b. mandibular fracture
  - c. maxilla fracture
  - g. tooth abscess
  - h. tooth extrusion
  - i. tooth fracture

- d. periodontitis
- e. temporomandibular joint dislocation
- f. temporomandibular joint dysfunction
- 7. administer appropriate sensory, neurological, and circulatory tests
- 8. administer functional tests and activity-specific tests
- 9. identify, palpate, and assess the integrity of bony landmarks
- 10. identify, palpate, and assess the integrity of soft tissue
- 11. administer commonly used special tests to make a differential assessment of the following:
  - a. cranial nerves (e.g., eye motion, facial muscles)
  - b. cognitive tests (e.g., recall, serial 7s, digit span)
  - c. cerebellar function (e.g., Romberg's test, finger-to-nose test, heel-toe walking, heel-to-knee standing)
  - d. spinal nerve roots (e.g., upper quarter screen)
  - j. tooth intrusion
  - k. tooth luxation

Cervical Spine Evaluation

The student will

- 1. obtain the medical history of an ill or injured athlete or other physically active individual
- 2. observe and identify the clinical signs and symptoms associated with common injuries, illnesses, and predisposing conditions:
  - a. atrophy
  - b. dislocation or subluxation
  - c. vertebral fracture
  - d. head and neck posture
  - e. intervertebral disc herniation
  - f. nerve root compression or stretch
  - g. ischemia
  - h. torticollis
- 3. administer active and passive range-of-motion tests using quantifiable techniques (e.g., tape measure, goniometer, and inclinometer)
- 4. use manual muscle-testing techniques
- 5. administer appropriate sensory, circulatory, and neurological tests
- 6. administer functional tests and activity-specific tests
- 7. identify, palpate, and assess the integrity of bony landmarks
- 8. identify, palpate, and assess the integrity of soft tissue
- 9. administer commonly used special tests to make a differential assessment of the following:
  - a. nerve root compression (e.g., distraction/compression test, Spurling's test, shoulder depression test)
  - b. brachial plexus neuropathy (e.g., brachial tension test, Tinel's sign)
  - c. cervical disc herniation (e.g., Valsalva's maneuver)
  - d. neurovascular dysfunction (e.g., vertebral artery test)

Shoulder Evaluation

The student will

1. obtain the medical history of an ill or injured athlete or other physically active individual
2. observe and identify the clinical signs and symptoms associated with common injuries, illnesses, and predisposing conditions:
  - a. atrophy
  - b. bursitis
  - c. dislocation or subluxation
  - d. efficiency of movement
  - e. fracture
  - f. sprain
  - g. nerve injury
  - h. positioning (Sprengel's deformity)
  - i. strain
  - j. scapulohumeral rhythm
  - k. scapular winging
  - l. step deformity
  - m. symmetry
  - n. tenosynovitis and tendonitis
3. administer active and passive range-of-motion tests using standard goniometric techniques
4. use manual muscle-testing techniques
5. administer appropriate sensory, neurological, and circulatory tests
6. administer functional tests and activity-specific tests
7. identify and palpate bony landmarks
8. identify and palpate soft tissue landmarks
9. administer commonly used special tests to make a differential assessment of the following
  - a. glenohumeral instability (e.g., anterior drawer test, posterior drawer test, relocation test, apprehension test, clunk test, sulcus sign)
  - b. acromioclavicular instability (e.g., shear test, compression test)
  - c. rotator cuff impingement/inflammation (e.g., Speed's test, drop arm test, empty can test, impingement test, Hawkins-Kennedy impingement test, Neer impingement test, pectoralis major contracture test)
  - d. biceps and biceps tendon pathology (e.g., Yergason's test, Ludington's test)
  - e. thoracic outlet syndrome (e.g., Adson's maneuver, Allen test, military brace position)

Elbow Evaluation

The student will

1. obtain the medical history of an ill or injured athlete or other physically active individual
2. observe and identify the clinical signs and symptoms associated with common injuries, illnesses, and predisposing conditions:
  - a. symmetry
  - b. carrying angle (cubital valgus and varus)
  - c. dislocation or subluxation
  - d. fracture
  - e. atrophy
  - f. efficiency of movement
  - g. bursitis
  - h. epicondylitis
  - i. tenosynovitis and tendonitis
  - j. osteochondritis dissecans
  - k. sprain
  - l. strain
  - m. nerve injury
3. administer active and passive range-of-motion tests using standard goniometric techniques
4. use manual muscle-testing techniques
5. administer appropriate sensory, neurological, and circulatory tests
6. administer functional tests and activity-specific tests
7. identify, palpate, and interpret the integrity of bony landmarks
8. identify, palpate, and interpret the integrity of soft tissue
9. administer commonly used special tests to make a differential assessment of the following
  - a. joint instability (e.g., valgus stress test, varus stress test)
  - b. inflammatory conditions (e.g., tests for lateral epicondylitis, tests for medial epicondylitis)
  - c. neuropathy (e.g., Tinel's sign, pronator teres syndrome, pinch grip test)

Forearm, Wrist, and Hand Evaluation

The student will

1. obtain the medical history of an ill or injured athlete or other physically active individual
2. observe and identify the clinical signs and symptoms associated with the following
  - a. fracture (Colles' fracture, Bennett's fracture, carpal fracture ["boxer's fracture"], metacarpal fracture, phalanges fracture)
  - b. dislocation or subluxation
  - c. disease states (e.g., clubbed nails, spoon-shaped nails)
  - d. soft tissue pathology (e.g., sprain, flexor tendon avulsion [jersey finger sign], extensor tendon avulsion [mallet finger], extensor tendon rupture [boutonniere deformity], volar plate rupture [pseudo-boutonniere deformity], Dupuytren's contracture, ganglion, swan neck deformity, trigger finger)
  - e. neurovascular involvement (e.g., carpal tunnel syndrome, bishop's or benediction deformity, ape hand, claw fingers, drop-wrist deformity, Volkmann's contracture)
3. administer active and passive range-of-motion tests using standard goniometric techniques
4. use manual muscle-testing techniques
5. administer appropriate sensory, neurological, and circulatory tests
6. administer functional tests and activity-specific tests
7. identify, palpate, and interpret the integrity of bony landmarks
8. identify, palpate, and interpret the integrity of soft tissue
9. administer commonly used special tests to make a differential assessment of the following:
  - a. inflammatory conditions (e.g., Finkelstein test)
  - b. joint instability (e.g., valgus stress test, varus stress test, glide tests)
  - c. neurovascular pathology (e.g., Tinel's sign, Phalen's test)

Thoracic/Lumbar Spine Evaluation

The student will

1. obtain the medical history of an ill or injured athlete or other physically active individual
2. observe and identify the clinical signs and symptoms associated with common injuries, illnesses, and predisposing conditions:
  - a. café au lait macules (spots)
  - b. dislocation or subluxation
  - c. spina bifida occulta
  - d. facet syndrome
  - e. intervertebral disc pathology
  - f. spinal posture (kyphosis/ lordosis)
  - g. leg length discrepancies
  - h. nerve root compression
  - i. sacroiliac dysfunction
  - j. scoliosis
  - k. vertebral pathology (e.g., spondylitis, spondylolysis, spondylolisthesis)
  - l. sprain
  - m. stenosis
  - n. step deformity
  - o. strain
3. administer active and passive range-of-motion tests using standard qualitative and quantitative techniques
4. use manual muscle-testing techniques
5. administer appropriate sensory and neurological tests
6. administer functional tests and activity-specific tests
7. identify, palpate, and interpret the integrity of bony landmarks
8. identify, palpate, and interpret the integrity of soft tissue

9. administer commonly used special tests to make a differential assessment of the following:
  - a. intervertebral disc herniation (e.g., Valsalva's maneuver)
  - b. neuropathy (e.g., straight leg raise test, well straight leg test, Babinski's reflex test, Oppenheim's gait test, Kernig's sign, Brudzinski sign test, bowstring test, Hoover sign test)
  - c. vertebral defects (e.g., stork standing test/spondylolisthesis test)
  - d. joint instability (e.g., spring test)

Hip/Pelvis Evaluation

The student will

1. obtain the medical history of an ill or injured athlete or other physically active individual
2. observe and identify the clinical signs and symptoms associated with common injuries, illnesses, and predisposing conditions:

a. leg length discrepancies b. hip retroversion c. hip anteversion d. Legg-Calv9-Perthes disease e. apophysitis f. slipped capital femoral epiphysis g. dislocation or subluxation h. fracture i. stress fracture	j. osteitis pubis k. athletic pubalgia l. bursitis m. piriformis syndrome n. iliotibial band syndrome o. contusion p. sprain q. strain r. tendonitis
3. administer active and passive range-of-motion tests using standard goniometric techniques and/or a tape measure
4. use manual muscle-testing techniques
5. administer appropriate sensory, neurological, and circulatory tests
6. administer functional tests and activity-specific tests
7. identify, palpate, and interpret the integrity of bony landmarks
8. identify, palpate, and interpret the integrity of soft tissue
9. administer commonly used special tests to make a differential assessment of the following:
  - a. sacroiliac dysfunction (e.g., Patrick's/FABER, Gaenslen's test, pelvic compression/distraction test)
  - b. neuropathy (e.g., femoral nerve traction test)
  - c. neuromuscular pathology (e.g., Trendelenburg test, Thomas test, rectus femoris contracture test, Ober test, Noble's test, piriformis test)

Knee Evaluation

The student will

1. obtain the medical history of an ill or injured athlete or other physically active individual
2. observe and identify the clinical signs and symptoms associated with common injuries, illnesses, and predisposing conditions:
  - a. bursitis
  - b. chondromalacia patella
  - c. dislocation and subluxation
  - d. fat pad contusion
  - e. fracture
  - f. leg length
  - g. meniscal tear
  - h. Osgood-Schlatter disease
  - i. osteochondritis dissecans
  - j. patellar alignment (e.g., patella alta, patella baja, squinting patella, Q angle)
  - k. patellar tendon rupture
  - l. peroneal nerve contusion or palsy

- m. popliteal cyst
- n. sprain
- o. strain
- p. tendonitis
- q. tibial torsion
- r. tibiofemoral alignment (e.g., genu recurvatum, genu valgum, genu varum)
- 3. administer active and passive range-of-motion tests using standard goniometric techniques
- 4. use manual muscle-testing techniques
- 5. administer appropriate sensory, neurological, and circulatory tests
- 6. administer functional tests and activity-specific tests
- 7. identify, palpate, and interpret the integrity of bony landmarks
- 8. identify, palpate, and interpret the integrity of soft tissue
- 9. administer commonly used special tests to make a differential assessment of the following:
  - a. uniplanar stress tests (e.g., valgus stress test, varus stress test, Lachman test, anterior drawer test, posterior drawer test, posterior sag sign)
  - b. multiplanar (rotational) stress tests (e.g., Slocum test, Hughston's test, lateral pivot shift maneuver)
  - c. meniscal tears (e.g., McMurray's test, Apley's test)
  - d. patellofemoral dysfunction (e.g., grind test, apprehension test)
  - e. intra-extracapsular swelling (e.g., sweep test, ballottable patella)

Leg, Ankle and Foot Evaluation

The student will

- 1. obtain the medical history of an ill or injured athlete or other physically active individual
- 2. observe and identify the clinical signs and symptoms associated with the following common injuries, illnesses, and predisposing conditions:
  - a. overuse injuries (e.g., bursitis, exostosis, fasciitis, stress fracture, tarsal tunnel syndrome, tendonitis and/or tenosynovitis, tibial stress syndrome)
  - b. Achilles tendon rupture
  - c. compartment syndromes
  - d. apophysitis
  - e. dislocation or subluxation
  - f. foot type/structure (e.g., forefoot varus/valgus, equinus deformity, pes cavus/planus, plantar flexed first ray, rearfoot [hindfoot] varus/valgus)
  - g. fracture
  - h. deep vein thrombosis (e.g., Homans' sign)
  - i. neuroma
  - j. osteochondritis dissecans
  - k. sprain
  - l. strain
  - m. toe structure/alignment (e.g., bunion, claw toes, hallux rigidus, hallux valgus, hammer toes, mallet toe, Morton's foot syndrome)
  - n. weight-bearing versus non-weight-bearing alignment
  - o. gait
- 3. administer active and passive range-of-motion tests using standard goniometric techniques
- 4. use manual muscle-testing techniques
- 5. administer appropriate sensory, neurological, and circulatory tests
- 6. administer functional tests and activity-specific tests
- 7. identify, palpate, and interpret the integrity of bony landmarks
- 8. identify, palpate, and interpret the integrity of soft tissue
- 9. administer the following commonly used special tests to make a differential assessment:
  - a. compression test (e.g., Pott's fracture)
  - e. talar tilt test

- b. percussion test
- c. anterior drawer test
- d. Kleiger's test

- f. Thompson test
- g. Tinel's sign
- h. Homans' sign

Acute Care of Injury and Illness

Teaching Objective 1:

The student will demonstrate the ability to implement an emergency action plan (EAP).

Specific Outcomes

1. The student will demonstrate the ability to implement an EAP for an activity, setting, or event.
2. The student will correctly triage emergency situations.

Teaching Objective 2:

The student will demonstrate the ability to apply first-aid techniques using universal precautions.

Specific Outcomes

1. The student will demonstrate the ability to
  - a. manage open and closed wounds
  - b. apply direct and indirect pressure to control bleeding
  - c. clean, debride, and protect an open wound
  - d. apply superficial skin closures
  - e. properly apply and remove gloves and other personal protective equipment
  - f. properly dispose of biohazardous waste
  - g. apply appropriate dressings
  - h. apply ice, compression, and elevation to an acute sprain, strain, or contusion

Teaching Objective 3:

The student will demonstrate the ability to apply immobilization devices to applicable body parts.

Specific Outcomes

1. The student will demonstrate the ability to
  - a. select and apply an appropriate splint to a sprain, strain, fracture, subluxation, and dislocation
  - b. stabilize and spine board or body splint an adult or child with a suspected spinal injury

Teaching Objective 4:

The student will recognize and manage environmentally related injuries and illnesses and, when indicated, refer the patient to the proper medical professional.

Specific Outcomes

1. The student will evaluate and manage the following:
  - a. heat exhaustion
  - b. heat syncope
  - c. heat stroke
  - d. hypothermia

Teaching Objective 5:

The student will demonstrate the ability to perform basic life-support techniques.

Specific Outcomes

1. The student will demonstrate the ability to
  - a. establish and manage an airway
  - b. establish and manage an airway in an athlete wearing protective headgear
  - c. perform CPR on an adult or child with or without a spinal injury
  - d. use a bag-valve-mask (BVM) on an adult or child for rescue breathing
  - e. use a protective pocket mask/shield on an adult or child for rescue breathing

Teaching Objective 6:

The student will demonstrate the ability to use various methods of stabilization and transportation to facilitate the movement or ambulation of the injured person.

Specific Outcomes

1. The student will demonstrate the ability to
  - a. stabilize and transport an adult or child with a head and/or spinal injury
  - b. stabilize and transport an adult or child with a fracture and/or dislocation
  - c. select, fit, and instruct the patient in the use of crutches
  - d. select, fit, and instruct the patient in the use of a cane
  - e. transport an injured adult or child using a manual conveyance technique
  - f. perform two-person CPR
  - d. assist a drowning victim

Pharmacology

Teaching Objective 1

The student will locate and utilize pharmaceutical products, storage, dispensing, and tracking information.

Specific Outcomes

The student will

1. Use the PDR or another drug reference to search for information on the medications commonly prescribed to athletes and others involved in physical activity and to identify the following facts:
  - a. generic and brand names
  - b. indications for use
  - c. contraindications
  - d. warnings
  - e. dosing
  - f. other notes (e.g., banned substance)
  - g. side (adverse) effects
2. Document, or simulate the documentation of, the tracking of medications by recording the following information about the medication:
  - a. name
  - b. manufacturer
  - c. amount
  - d. dosage
  - e. lot number
  - f. expiration date
3. Locate the policies-and-procedures manual, identify the section on medications, and replicate the procedures for administering medications to athletes and others involved in physical activity, which include the following:
  - a. determine type of over-the-counter (OTC) medication to be used according to the physical ailment and established protocols
  - b. identify the precautions, expiration date, lot number, and dosage for the medication as provided on the package and individual dose packets
  - c. administer OTC medication by providing verbal and written instruction for its use to the patient and then recording and documenting the administration

Teaching Objective 2

The student will activate a poison control service.

Specific Outcome

1. Locate the phone number and address of the nearest poison control center and replicate the reporting of a drug overdose or poisoning situation. The report should state the following information:
  - a. name and location of person making the call
  - b. name and age of person who has taken the medication
  - c. name and dosage of the drug taken
  - d. time the drug was taken
  - e. signs and symptoms associated with overdose or poison situation, including vital signs

Teaching Objective 3

The student will demonstrate the ability to instruct the use of and administer bronchodilators and epinephrine.

Specific Outcome

1. Replicate the following procedures for using an emergency epinephrine injection to prevent anaphylaxis:
  - a. identify indications for an epinephrine injection
  - b. demonstrate proper use through verbal and nonverbal instruction
  - c. identify signs and symptoms that might indicate an allergic reaction to or overdose of epinephrine
  - d. demonstrate proper storage of epinephrine injectable
  - e. demonstrate proper disposal of used injection system

2. Replicate the following procedures for using an emergency bronchodilator (inhaler) to prevent asthma attacks:
- a. identify indications for use of a bronchodilator
  - b. demonstrate proper use through verbal and nonverbal instruction
  - c. identify signs and symptoms that might indicate an allergic reaction to or overdose of a bronchodilator
  - d. demonstrate proper storage of a bronchodilator

Therapeutic Modalities

Teaching Objective 1:

The student will relate the findings of a physical examination to determine the appropriate course of treatment.

Specific Outcomes

1. The student will perform a physical examination to identify the current inflammatory stage.
2. The student will perform a physical examination and interview to identify the indications, contraindications, and precautions to various treatment protocols.

Teaching Objective 2:

The student will demonstrate the ability to apply therapeutic modalities.

Specific Outcomes

Cryotherapy

1. The student will demonstrate the ability to select the appropriate parameters for and then prepare and apply the following:
  - a. cold whirlpool treatment
  - b. controlled cold therapy unit
  - c. ice pack
  - d. vapo-coolant spray
  - e. ice immersion
  - f. ice massage
  - g. cryokinetics

Thermotherapy

1. The student will demonstrate the ability to select the appropriate parameters for and then prepare and apply the following:
  - a. moist heat pack
  - b. paraffin treatment
  - c. contrast bath
  - d. warm whirlpool treatment

Electrotherapy

1. The student will demonstrate the ability to select the appropriate parameters for and then prepare and apply the following:
  - a. sensory-level pain control treatment
  - b. noxious-level pain control treatment
  - c. motor-level pain control treatment
  - d. muscle re-education treatment
  - e. muscle pumping treatment
  - f. muscle atrophy retardation
  - g. acute edema treatment
  - h. muscle splinting/spasm treatment
  - i. iontophoresis treatment
2. The student will set-up and apply the following types of electrical stimulation units:
  - a. monophasic stimulator (e.g., high volt stimulation)
  - b. biphasic stimulator (e.g., Transcutaneous Electrical Nerve Stimulation [TENS], Neuromuscular Electrical Stimulation [NMES])
  - c. direct current (e.g., iontophoresis)
  - d. alternating current (e.g., interferential, NMES)
  - e. multifunction electrical stimulation devices

Ultrasound

1. The student will demonstrate the ability to select the appropriate parameters for and then prepare and apply the following:
  - a. thermal ultrasound treatment
  - b. non-thermal ultrasound treatment
  - c. combination electrical-stimulation/ultrasound treatment
  - d. phonophoresis treatment
  - e. indirect application of ultrasound treatment (underwater, bladder)

Traction

1. The student will demonstrate the ability to select the appropriate parameters for and then prepare and apply the following:
  - a. mechanical traction
  - b. manual traction
  - c. positional traction

Intermittent Compression

1. The student will demonstrate the ability to select the appropriate parameters for and then prepare and apply intermittent compression to the upper and lower extremities.

Therapeutic Massage

1. The student will demonstrate the ability to prepare and apply a massage treatment.
2. The student will demonstrate the ability to properly perform the following therapeutic massage strokes:

a. effleurage	d. tapotement
b. petrissage	e. vibration
c. friction (circular, transverse)	f. myofascial release techniques

Therapeutic Exercise

Teaching Objective 1:

The student will demonstrate the ability to perform therapeutic exercises.

Specific Outcomes

1. Exercise to improve the range of motion of the upper extremity, lower extremity, trunk, and cervical spine.

The student will demonstrate the ability to instruct the following exercises:

- a. passive range-of-motion exercises
- b. active range-of-motion exercises
- c. active-assisted range-of-motion exercises
- d. joint mobilization
- e. self-mobilizations

2. Exercise to improve muscular strength.

The student will demonstrate the ability to instruct exercises for the following parts of the body using isometric and progressive resistance techniques:

- a. lower extremity
- b. upper extremity
- c. cervical spine
- d. trunk and torso

3. Exercise to improve muscular endurance.

The student will demonstrate the ability to instruct the following exercise modalities:

Upper body

- a. aquatic
- b. UBE/stationary bicycle
- c. physioballs

Lower Body

- a. aquatic
- b. stationary bicycle
- c. stair
- d. physioballs
- e. treadmill

4. Exercise to improve muscular speed.

The student will demonstrate the ability to instruct the following activities:

Upper body

- a. reaction drills

Lower Body

- a. reaction drills
- b. sprint work
- c. Fartlek training

5. Exercise to improve muscular power.

The student will demonstrate the ability to instruct plyometric exercises for the upper and lower extremities.

6. Exercise to improve neuromuscular control and coordination.

The student will demonstrate the ability to instruct the following activities:

Upper body

- a. PNF patterns
- b. rhythmic stabilization
- c. double- and single-arm balancing
- d. wobble board or balance apparatus
- e. weighted-ball rebounding or toss

Lower Body

- a. PNF patterns
- b. proprioception board or balance apparatus
- c. incline board
- d. Single-leg balancing

Neck

- a. stabilization
- b. postural correction

Trunk

- a. stabilization
- b. postural correction

7. Exercise to improve agility.

The student will demonstrate the ability to instruct the following activities:

Upper body

- a. throwing
- b. catching

Lower Body

- a. Carioca
- b. cross-over
- c. figure eight (8)

8. Exercise to improve cardiorespiratory endurance.

The student will demonstrate the ability to instruct the following activities:

Upper body

- a. upper-body ergometer
- b. stationary bicycle
- c. aquatic
- d. stair climber

Lower Body

- a. bicycle ergometer
- b. treadmill
- c. stair climber
- d. aquatic

9. The student will demonstrate the ability to assess joint end point and to select and perform appropriate joint mobilization techniques for the appendicular and axial skeleton, including the following:

- a. long-axis distraction
- b. appropriate glides (e.g., anterior/posterior, superior/inferior)

10. The student will demonstrate the ability to instruct and perform exercises to improve activity-specific skills (running, striking, throwing, catching, swimming, biking, climbing, etc.).

General Medical Conditions and Disabilities

Specific Outcomes

The student will

1. Obtain a basic medical history that includes the following components:
  - a. previous medical history
  - b. previous surgical history
  - c. pertinent family medical history
  - d. current medication history
  - e. relevant social history
  - f. chief medical complaint
2. Ascertain body temperature via the following:
  - a. oral temperature
  - b. axillary temperature
  - c. tympanic temperature
3. Ascertain the following vital signs:
  - a. blood pressure
  - b. pulse (rate and quality)
  - c. respirations (rate and quality)
4. Palpate the four abdominal quadrants to assess for the following:
  - a. guarding and rigidity
  - b. pain
5. Use a stethoscope to identify the following:
  - a. normal breath sounds
  - b. normal heart sounds
  - c. normal bowel sounds
6. Identify pathological breathing patterns to make a differential assessment for the following respiratory conditions:
  - a. apnea
  - b. tachypnea
  - c. hyperventilation
  - d. bradypnea
  - e. dyspnea
  - f. obstructed airway
7. Demonstrate proficiency in the use of an otoscope to examine the nose and the outer and middle ear.
8. Measure urine values with Chemstrips (dipsticks)
9. Recognize the signs, symptoms, and predisposing conditions associated with the following diseases and conditions:

The Skin

a. abscesses	o. herpes zoster
b. acne vulgaris	p. hives
c. carbuncle	q. impetigo
d. cellulitis	r. psoriasis
e. molluscum contagiosum	s. ringworm
f. dermatitis	t. scabies
g. eczema	u. sebaceous cysts
h. folliculitis	v. tinea cruris
i. frostbite	w. tinea pedis
j. furunculosis	x. verruca plantaris
k. herpes simplex	y. verruca vulgaris
l. tinea versicolor	z. tinea capitis
n. pediculosis	

The Eyes, Ears, Nose, and Throat

a. common cold	e. rhinitis
b. conjunctivitis	f. sinusitis

- c. laryngitis
- d. pharyngitis

- g. tetanus
- h. tonsillitis

Respiratory System

- a. asthma
- b. bronchitis
- c. hyperventilation
- d. hay fever

- e. influenza
- f. pneumonia
- g. upper respiratory infection (URI)

Cardiovascular System

- a. hypertension
- b. hypertrophic cardiomyopathy
- c. hypotension

- d. migraine headache
- e. shock
- f. syncope

Endocrine System

- a. diabetes
- b. hyperthyroidism

- c. hypothyroidism
- d. pancreatitis

Gastrointestinal Tract

- a. appendicitis
- b. colitis
- c. constipation
- d. diarrhea
- e. esophageal reflux

- f. gastritis
- g. gastroenteritis
- h. indigestion
- i. ulcer
- j. irritable bowel syndrome

Eating Disorders

- a. anorexia
- b. bulimia
- c. obesity

Sexually Transmitted Diseases/Diseases Transmitted by Body Fluid

- a. HIV/AIDS
- b. hepatitis
- c. chlamydia

- d. genital warts
- e. gonorrhea
- f. syphilis

Genitourinary Tract and Organs

- a. kidney stones
- b. spermatic cord torsion
- c. candidiasis
- d. urethritis

- e. urinary tract infection
- f. hydrocele
- g. varicocele

Gynecological Disorders

- a. amenorrhea
- b. dysmenorrhea
- c. oligomenorrhea

- d. pelvic inflammatory disease
- e. vaginitis

Viral Syndromes

- a. infectious mononucleosis
- b. measles
- c. mumps

Neurological Disorders

- a. epilepsy

- c. reflex sympathetic dystrophy

b. syncope

d. meningitis

Systemic Diseases

- a. iron-deficiency anemia (systemic)
- b. sickle cell anemia (systemic)
- c. Lyme disease

Nutritional Aspects of Injury and Illnesses

Teaching Objective 1

The student will demonstrate the ability to design general nutrition programs for athletes and others involved in physical activity.

Specific Outcomes

1. The student will demonstrate the ability to access and recommend nutritional guidelines for the following:
  - a. pre-participation meal
  - b. weight loss
  - c. weight gain
  - d. fluid replacement
2. The student will demonstrate the ability to use the nutritional food pyramid.
3. The student will demonstrate the ability to access and assess the following nutritional intake values:
  - a. RDA or equivalency
  - b. protein intake
  - c. fat intake
  - d. carbohydrate intake
  - e. vitamin intake
  - f. mineral intake
  - g. fluid intake
4. The student will demonstrate the ability to determine energy expenditure and caloric intake.
2. The student will demonstrate the ability to calculate the basal metabolic rate of energy expenditure.
3. Simulate intervention with an individual who has the signs and symptoms of disordered eating. Identify proper referral sources for disordered eating.

Psychosocial Intervention and Referral

Teaching Objective 1

The student will demonstrate the ability to intervene and make the referral to appropriate medical or allied medical professional.

Specific Outcomes

The student will

1. Simulate intervention with an individual who has a substance abuse problem and recommend appropriate referral
2. Simulate a confidential conversation with a health care professional concerning suspected substance abuse by an athlete or other physically active individual
3. Locate the available community-based resources for psychosocial intervention

Teaching Objective 2

The student will integrate motivational techniques into the rehabilitation program.

Specific Outcome

The student will

1. Simulate the following motivational techniques used during rehabilitation:
  - a. verbal motivation
  - b. visualization
  - c. imagery
  - d. desensitization

Health Care Administration

Teaching Objective 1:

The student will demonstrate appropriate communication skills.

Specific Outcomes

1. The student will
  - a. calm, reassure, and explain a potentially catastrophic injury to an injured adult or child, athletic personnel, and/or family member
  - b. effectively communicate and work with physicians, emergency medical technicians (EMTs), and other members of the allied health care community and sports medicine team
  - c. appropriately communicate with athletic personnel and family members
  - d. use ethnic and cultural sensitivity in all aspects of communication
  - e. communicate with diverse community populations

Teaching Objective 2:

The student will use contemporary multimedia, computer hardware, and software as related to the practice of athletic training.

Specific Outcomes

1. The student will access information and manage data using contemporary multimedia, computer equipment, and software. This should include, but not be limited to, use of the following:
  - a. word processing software
  - b. file management systems
  - c. spreadsheets
  - d. budgeting software
  - e. injury tracking software
  - f. the World Wide Web
  - g. communication (e-mail)
  - h. presentation software

Teaching Objective 3:

The student will demonstrate the ability to perform record keeping skills with sensitivity to patient confidentiality.

Specific Outcomes

1. The student will
  - a. use standardized record keeping methods (e.g., SOAP, HIPS, HOPS)
  - b. select and use injury, rehabilitation, referral, and insurance documentation
  - c. use progress notes
  - d. organize patient files to allow systematic storage and retrieval

Teaching Objective 4:

The student will demonstrate the ability to develop athletic training facilities and administrative plans.

Specific Outcomes

1. The student will demonstrate the ability to develop facility design plans that include, but are not limited to, the following components:
  - a. basic floor plan design
  - b. facility evacuation
  - c. basic rehabilitation and treatment area plans
2. The student will demonstrate the ability to develop administrative plans that include but are not limited to, the following components:
  - a. risk management
  - b. developing policies and procedures
  - c. developing budget (expendable and capital)

- d. addressing facility hazards

Teaching Objective 5:

The student will demonstrate the ability to prepare and interpret sample design for scientific research.

Specific Outcomes

- 1. The student will interpret the following basic literature:
  - a. case study
  - b. outcome measurement, including statistical interpretation
  - c. literature review

Professional Development and Responsibilities

Teaching Objective 1

The student will demonstrate the ability to disseminate injury prevention and health care information.

Specific Outcomes

1. The student will develop a presentation outline for an athletic training topic. The outline may include, but is not limited to, the following audiences:
  - a. peer athletic trainers
  - b. physicians
  - c. parents
  - d. athletic personnel
  - e. general public
  - f. athletes and others involved in physical activity
2. The student will develop a professional resume.