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Cost Benefits: Injury Prevention Shoulder Program and Insurance Premiums

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COST BENEFITS: INJURY PREVENTION SHOULDER PROGRAM AND INSURANCE
PREMIUMS

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Abstract

The shoulder complex of the baseball athlete is exposed to countless stressors that can potentially cause injury. There are numerous predisposing risk factors that could possibly increase the rate at which injury occurs. Athletes at the collegiate level, due to age, are at the highest risk for significant shoulder injury. Those injuries can be extremely costly and athletes at the collegiate level tend to be at the highest risk for financial loss. As of 2005, the NCAA mandated that each student-athlete that participates in any NCAA practice or game must have health insurance that could potentially cover up to \$90,000 worth of claims. The institution has two decision to either leave all leftover costs to the responsibility of the student-athlete or purchase a secondary insurance that will help cover remaining costs that the primary insurance does not cover. The choice of an institution to purchase secondary insurance can be a burden due to the extra costs that tax the athletic department's budget. With each and every shoulder injury that is suffered by a baseball student-athlete the insurance premium of the school will be increased thus putting an unnecessary cost on the school's budget. In order to decrease this cost, the use of an injury prevention shoulder program that is applied to a Division I baseball program was utilized and the premiums were analyzed in order to see the decrease in costs that were adding to the insurance program. Insurance claims were tallied for the years 2012-2013, 2013-2014, 2014-2015 and 2015-2016. The amount of shoulder injuries from baseball student-athletes were analyzed. The results showed that there was a decrease in the amount of shoulder injury after the injury maintenance shoulder program was implemented, thus decreasing the medical expenses that are spent on shoulder injuries for the baseball student-athlete. These results show that there is indeed a positive correlation between the use of an injury maintenance shoulder program and decreasing the amount of medical expenditures that come from the Baseball student-athlete.

Introduction

The shoulder complex of the human body is one of the most intricate yet impressive joints that allows the body significant movement and force within a single motion. The shoulder complex has a great deal of mobility, which in turn compromises the stability of the joint (Prentice, 2009). This joint is incredibly complicated as it provides the body with an extensive yet precise range of motion in all three anatomical planes of the body (Starkey, Brown, & Ryan, 2010). The ability of the joint to move “multidirectionally, emit impressive amounts of force, and create the tiniest movements of the hand makes it a very valuable asset to everyday life” (Wilk, Andrews & Reinold, 2009, p. 3). This joint lacks the bony structures and the muscular stabilizers that exist within the other joints of the body that provide them with stability (Starkey, Brown, & Ryan, 2010). The glenohumeral joint along with the scapulothoracic joint articulation, sternoclavicular joint, and acromioclavicular joint come together to make up the shoulder complex. These joints “provide the upper limb with a range of motion exceeding that of any other joint mechanism” (Wilk, Andrews & Reinold, 2009, 3).

The sternoclavicular joint is the only joint that connects the shoulder complex to the axial skeleton; thus allowing elevation and depression, protraction and retraction, and long-axis rotation of the clavicle (Wilk, Andrews & Reinold, 2009). The acromioclavicular joint contributes to the total arm movement and also assists to transmit force between the clavicle and the acromion (Wilk, Andrews & Reinold, 2009). One of the major responsibilities of the acromioclavicular joint is to elevate the arm allowing lateral rotation of the scapula after 100 degrees of abduction, which creates a larger amount of range of motion. This joint also facilitates a gliding movement as the joint experiences flexion and extension while it also elevates and

depresses to conform when the relationship between the scapula and humerus changes during abduction (Wilk, Andrews & Reinold, 2009).

The scapulothoracic articulation is not considered a true joint anatomically due to the fact that it lacks synovial joint characteristics (Starkey, Brown, & Ryan, 2010). These characteristics include connection by fibrous, cartilaginous and synovial tissues that provide support for the other synovial joints in the body (Starkey, Brown, & Ryan, 2010). The scapulothoracic articulation provides the movement between the thoracic spine and the scapula of the shoulder. This articulation provides a rhythmic movement throughout the shoulder complex that keeps the shoulder moving smoothly throughout total range of motion. Smooth motion and normal rhythmic patterns are extremely important when it comes to the shoulder complex working within normal limits. Numerous muscles that attach to this articulation are utilized during this rhythmic pattern which requires proper strength and flexibility in order to keep the normalcy of movement during this motion. Without the proper function of these muscles, there is a tendency to experience pain and a decrease of proper range of motion in the shoulder complex.

The glenohumeral joint is the main contributor of motion to the shoulder complex. The joint is a multi-axial ball and socket synovial joint that promotes multidirectional motion, but stability of the joint is marginal compared to other joints in the complex (Wilk, Andrews & Reinold, 2009). The humeral head is only in contact with the glenoid fossa of the scapula 25-30% of the time during movement (Wilk, Andrews & Reinold, 2009). Since there is significantly less stability within this joint there are several factors that contribute to the glenohumeral joint to help maintain stability. These factors are osseous configuration (joint geometry), the glenoid labrum, the glenohumeral capsule, the neuromuscular system, and the negative intra-articular

pressure (Wilk, Andrews & Reinold, 2009). All of these contributors are the reason as to why the glenohumeral joint can maintain function.

With the combined relationship between the glenohumeral joint, acromioclavicular joint, sternoclavicular joint, and the scapulothoracic articulation, the shoulder complex is more mobile than any other joint in the body. Stability is required during any type of dynamic activity, which occurs on a regular basis in everyday life. When an individual lives a more active lifestyle there is more stress that is put onto the shoulder complex as a whole. One type of individual that can inherently experience more stressors on the shoulder complex is the baseball athlete (Wilk, Andrews & Reinold, 2009). With the range of motion present at the shoulder joint comes a great deal of injuries that can potentially develop. The act of throwing accounts for a substantial amount of chronic and acute shoulder injuries (Prentice, 2009). Therefore, the importance of understanding the anatomy of the shoulder complex is needed when preventing injury.

The baseball athlete puts an enormous amount of stress on the shoulder complex during the throwing motion that can lead to injury. Throwing is “a skilled movement that requires excessive motion, precisely coordinated movement, and a synchronized muscle-firing pattern, all of which must occur at a velocity faster than any other movement” (Wilk, Andrews & Reinold, 2009, p. 401). Throwing is a successive movement that requires the arm to perform carefully timed and executed acts (Prentice, 2009). Through all of this excessive motion, the shoulder complex must be able to maintain joint stability, which is achieved by its capsular ligamentous restraints and the neuromuscular control system of the shoulder (Wilk, Andrews & Reinold, 2009).

During each phase of throwing there are different stresses and demands that are placed on the shoulder complex. Throughout the act of throwing a baseball the shoulder complex is

subjected to large amounts of momentum that is transferred from the body to the ball (Prentice, 2009). The faster or heavier the object that is being thrown will put a greater stress on the shoulder complex do to basic physics (Prentice, 2009). Throwing occurs through different phases of the shoulder complex and depending on the researcher the number of phases vary (Houglum, 2010). The most commonly utilized concept of the number of phases is five phases in which the shoulder complex passes through during the throwing motion (Houglam, 2010). These phases are the windup, cocking, acceleration, deceleration, and the follow-through (Prentice, 2009).

The acceleration phase can place the shoulder joint at an angular velocity of up to 7000 degrees and the anterior translation stress on the glenohumeral joint can reach up to about half of the thrower's body weight (Wilk, Andrews & Reinold, 2009). In order for acceleration to be facilitated, excessive laxity of the glenohumeral joint must be obtained during the cocking phase in order to pre-stretch the anterior shoulder musculature (Wilk, Andrews & Reinold, 2009). After the ball is released the shoulder complex enters the deceleration phase in which the posterior shoulder musculature contracts eccentrically to offset the glenohumeral joint distraction that can occur at a rate that is equal the body weight of the athlete (Wilk, Andrews & Reinold, 2009). The musculature system of the shoulder must be able to provide enough stability during the throwing motion in order for the glenohumeral joint to maintain a consistent throwing motion. In order for the shoulder complex to avoid injury during the throwing motion, the shoulder must be able to withstand the stresses that occur during that motion (Wilk, Andrews, Reinold & 2009).

Injury of the shoulder complex can occur from a wide range of weaknesses that may be present within the shoulder, whether they be actual muscular weaknesses or fatigue. This along with poor throwing mechanics can cause a great deal of issues within the throwing shoulder. The “common injury-producing scenarios for the throwing athlete include the combination of

abnormally high stresses that are repeatedly applied to normal tissue, eventually resulting in tissue attenuation and failure” (Wilk, Andrews & Reinold, 2009, p. 401).

Being able to identify and prevent shoulder injuries can be a crucial key in prolonging the baseball athlete’s career. Baseball is now one of the most popular team sports in the United States with more than 18 million youths actively participating (Janda, 2003). Many of these youths begin playing at the age of 5 and can begin pitching as early as 8 years of age (Oyama, Register-Mihalik, Marshall & Mueller, 2014). With 867 baseball teams registering with the National Collegiate Athletic Association in 2004, 30 Major League Baseball teams, and 240 Minor League affiliates, the amount of throwing athletes is growing at an impressive rate (Janda, 2003). Thus, with the ever increasing number of baseball athletes, shoulder injuries are beginning to become detrimental to not just the individual, but the institution that houses these teams due to the increased healthcare cost in the United States. With 7% of shoulder injuries resulting in surgery in young athletes, the amount of medical expenses that can come from a shoulder injury can mount quickly and leave both the athlete and the institution at a loss (Oyama et al., 2014).

With the increase of healthcare costs and the number of shoulder injuries that are occurring, institutions that host NCAA Division I baseball are looking into new ways to help cover the costs of these injuries and save the athlete and sports medicine from extra costs. The bylaws of the NCAA state “that athletic departments may pay for the medical expenses of athletic related injuries and conditions” (Street, Yates, Lavery & Lavery, 1994, p. 9). Over the years the athletic departments at the Division I level have seen medical insurance premiums rise 10-15% annually and medical costs skyrocketing at 17-29% annually (Black, Laurence, Higgins & Warner, 2013). It is projected that the health care expenditures will nearly double from the 2.5

trillion dollars that was calculated in 2009 to an estimated 4.6 trillion dollars by 2020 with a 70 % increase in per capita during that time (Black et al., 2013). With that increase there will be a substantial increase in the insurance premiums that schools will pay in order to keep their student-athletes covered.

With almost 21% of Division I NCAA athlete being a throwing athlete and roughly 27,262 of throwing athletes being a baseball athlete, the importance of understanding and decreasing shoulder injury is critical in order to help offset rising healthcare costs for the Athletic Department (Laudner & Sipes, 2009; Dick et al., 2007). Medical costs for intercollegiate student-athletes are not limited to just the physicians, they come in forms of a well maintained athletic training room, equipment, personal costs, diagnostic testing, specialty consults and surgeries (Kaeding, Borchers, Oman & Perdroza, 2015). These costs are a financial burden to every institution, but also can be very preventable if the right measures are taken when caring for the throwing athlete.

Literature Review

Health insurance is “written to reimburse the insured personally for financial loss arising out of illness caused by specific diseases, or more frequently written, from any except specified diseases” (Lens & Lens, 2014, p. 4). Healthcare across the United States has been modified and has changed extensively over the past few years. An estimated 44 million Americans went without health insurance in 2013, causing devastating debt to a vast number of individuals. However, due to Healthcare Reform, health insurance has become a mandatory entity within the United States. On March 23, 2010, President Obama signed The Patient Protection and Affordable Care Act, also known as ObamaCare. This Act was made to help offer Americans a

“number of new benefits, rights, and protections in regards to their healthcare” (ObamaCare Facts, 2015, p. 1). This Act also mandated that

starting in 2014 most non-exempt Americans have to maintain a minimum essential coverage throughout each year, get an exemption, or pay a per month fee on their year-end federal income taxes for every month that they go uninsured healthcare wise (ObamaCare Facts, 2015, p. 1).

Now, with this reform there are many gray areas that have been exposed and confusion can sometimes arise when it comes to juggling primary and secondary insurance policies. It can result in the patient wondering what they are covered for, who pays for what, and what happens when there are leftover costs from doctor visits or medical procedures.

A primary insurance is defined as a plan “whose benefits for a person’s health care coverage must be determined without taking the existence of any other plan into consideration” (National Association of Insurance Commissioners, 2013, p. 120-5). A plan can be determined to be a primary plan if (1) “the plan has no order of benefit determination rules, or its rules differ from those permitted by this regulation; or (2) all plans that cover the person use the order of benefit determination rules required by this regulation, and under those rules the plan determines its benefits first” (National Association of Insurance Commissioners, 2013, p. 120-5). A secondary insurance defined by the National Association of Insurance Commissioners is “any plan that does not fall under the definitions of a primary plan” (2013, p. 120-6). When a service is rendered on behalf of an individual that carries a primary and/or secondary plan then a claim is filed to the insurance company in order to have expenses covered. A claim is defined as “a request that benefits of a plan be provided or paid” (National Association of Insurance Commissioners, 2013, p. 120-6). The benefits that can be claimed may be in the form of: (1) Services (including supplies); (2) payment for all or a portion of the expenses incurred; (3) a combination of (1) and (2); or (4) an indemnification” (National Association of Insurance

Commissioners, 2013, p. 120-5). When there are instances that a primary insurance does not cover the entire cost of a defined claim then the secondary insurance is put into effect to help cover the remaining expenses. However, there are strict rules that mandate what plan comes first and who pays which part of the claim. This is covered under Section 6 of the October 2012

Model Regulation Service of the National Association of Insurance Commissioners:

1. The primary plan shall pay or provide its benefits as if the secondary plan or plans did not exist.
2. If the primary plan is a closed panel (a plan that provides health benefits to covered persons primarily in the form of services through a panel of providers that have contracted with or are employed by the plan (p. 120-3)) the secondary plan shall pay or provide benefits as if it were the primary plan when a covered person uses a non-panel provider, except for emergency services or authorized referrals that are paid or provided by the primary plan.
3. When the multiple contracts providing coordinated coverage are treated as a single plan under this regulation, this section applies only to the plan as a whole, and the coordination among the component contracts is governed by the terms of the contracts. If more than one carrier pays or provides benefits under the plan, the carrier designated as primary within the plan shall be responsible for the plan's compliance with this regulation.
4. If a person is covered by more than one secondary plan, the order of benefit determination rules of regulation decide the order in which secondary plans benefits are determined in relation to each other. Each secondary plan shall be responsible for the plan's compliance with this regulation, has its benefits determined before those of that secondary plan (National Association of Insurance Commissioners, 2013, p. 120-7).

With these regulations that are in place, there becomes a better understanding of how a primary health insurance plan and a secondary health insurance plan operate together. In order to apply these types of rules and regulations about healthcare and the expenses that come from shoulder injuries in the intercollegiate baseball student-athlete, the understanding of National Collegiate Athletic Association (NCAA) rules and regulations about health insurance coverage are extremely important.

Since the beginning of the NCAA, the well-being of the student-athlete has long been a major priority. In 2013, NCAA bylaws allowed institutions to “provide medical and related

expenses and services to the student athlete” (Lens & Lens, 2014, p. 7). According to the NCAA, the insurance that athletic departments use to cover their athletics is called "accident insurance" which “covers injuries and illnesses that occur while playing sports” (NCAA website, 2015). Today, in the intercollegiate sports realm, this insurance has become a hot topic that has not always been readily discussed. Before the year 2005, many athletes that had been injured during the participation of a NCAA sporting event had little option when it came to health insurance. Many of those student-athletes had to end up solely relying on their parents’ insurance to cover the costs that their insurance did not cover or completely paying out of pocket for those expenses. (Lens & Lens, 2014). Many student-athletes began to try and find other ways to be compensated for their medical expenses, which included filing worker’s compensation claims and disability insurance claims against their universities. Unfortunately, many of these claims were denied because universities claimed that the student-athletes were not employees of the institutions in respects of the coined term amateurism (Lens & Lens, 2014).

Since 2005, however, insurance for the student-athletes’ injuries has improved remarkably at an incredible rate. In 2005, the NCAA requisitioned that every student-athlete have personal health insurance (Lens & Lens, 2014). The NCAA Bylaw 3.2.4.8 states

[a]n active member institution of the NCAA must certify insurance coverage for medical expenses resulting from athletically related injuries sustained while participating in a covered event. This certification must cover a student-athlete participating in a covered event in an intercollegiate sport as recognized by the participating institution and a prospective student-athlete participating in a covered event. Whatever the source of insurance coverage, it covers athletically related injuries that are a direct result of participating in a covered event (Lens & Lens, 2014, p. 6)

In order for this insurance to qualify a student athlete for participation, it must cover athletically related injuries and must have limits that match the NCAA Catastrophic Injury

Insurance Program deductible which currently aids up to \$90,000 and can be provided by any of the following three sources (1) “[p]arents’ or guardians’ insurance coverage, (2) the student athlete’s personal insurance coverage, or (3) institution’s insurance program” (NCAA, 2015; Lens & Lens, 2014, p. 6). If the student-athlete is only covered by their parent’s policy than the medical expenses will be paid accordingly to that plan. This insurance must be in place before the student-athlete can practice or play in competitions (NCAA, 2015). This type of insurance is known as basic accident coverage (NCAA, 2015). If this is not in place than the school is held liable for a violation under the NCAA regulation. However, the student-athlete’s eligibility is not affected by this. With this legislation the NCAA and its members ruled four important benefits that would come from the basic accident coverage:

1. Protects student-athletes/parents from incurring substantial, unexpected, out-of-pocket medical expenses for athletically related injuries.
2. Informs student-athletes/parents of the institution’s position on providing insurance and/or covering medical expenses for athletically-related injuries and eliminate misconceptions about the institution’s responsibility.
3. Tracks information about the availability of “other insurance” that can assist member institutions in projecting costs of excess insurance programs.
4. Protects member institutions from a liability perspective because student-athletes/parents are less likely to bring a lawsuit against the institution for an athletically-related injury if medical expenses are covered through some form of insurance (NCAA Overview of Legislation, 2011, p. 1).

The NCAA currently does provide all student-athletes at all NCAA institutions insurance coverage under the catastrophic program, which includes a premium of \$13.5 million. The NCAA catastrophic plan provides \$20 million in lifetime benefits to student-athletes that have become completely disabled while practicing or competing in a NCAA sport; this includes medical expenses and disability expenses. The NCAA also holds a Participant Accident Program that also covers any injury that occurs while participating in a NCAA championship with \$90,000 in coverage and will cover every expense beginning at the first dollar (NCAA, 2015).

Most universities usually have a secondary plan of insurance that helps to cover the costs of medical expenses. At the Division I level most student-athletes are covered as the larger institutions can provide secondary insurance to their student-athletes more readily than smaller institutions. The majority of the institutions will set their insurance at a secondary policy that will help pick up any expenses that the student-athlete's primary plan does not pick up; thus out of pocket medical expenses are almost completely eliminated (Lens & Lens, 2014, p. 6-7). With healthcare costs increasing dramatically over the last few years and with each injury claim the sports medicine department has to battle the ever-increasing premium. Some athletic departments have become so concerned with covering their student-athletes they have become "insurance poor" when trying to account for injury exposures (Valentic, 1996, p. 19). Meanwhile some athletic departments have completely decided to go uninsured because of the onerous costs of insurance, leaving the school and student-athletes to fend for themselves (Valentic, 1996). Schools across the nation are trying to find reasonable and economical ways to insure their student-athletes, but the options are scarce. For example, six public universities in South Dakota are facing an increase that more than doubles their secondary insurance. The institutions paid a total of \$618,460 in premiums in 2013 and they projected a \$1.4 million premium in the near future (Yahn, 2014). These increasing costs are well associated with the heightened price of the medical expenses that are incurred through athletic participation, specifically the baseball athlete.

With the collective literature that has been analyzed, the rate of shoulder injury that results in surgical intervention puts each baseball student-athlete and the program at substantial risk.. Costs that come from a shoulder injury do not only apply to the surgery itself, but there are costs that come from many different necessities when it comes to caring for a shoulder injury. The term cost "describes not only the cost of particular implants, surgical time, and physician

and hospital fees, but also the cost of postoperative rehabilitation, costs of complications and their sequelae and costs for missed work” (Black et al., 2013, p. 1004).

Shoulder disorders play a significant role in the cost of healthcare, in 2000 the direct cost of medical expenses from treating shoulder pain was estimated at several billion dollars (Black et al., 2013). Between 1996 and 2006 there was a 141% increase in rotator cuff repairs alone (Black et al., 2013). According to Churchill and Ghorai (2010) approximately 75,000 rotator cuff repairs are performed annually with the average total medical expenses equaling out to \$8, 640.

Arthroscopic Bankart lesion surgeries can cost on average \$4,747, whereas an open Bankart lesion surgery can cost on average \$6,062 due to the different amounts of anesthesia and equipment that is used in the varying surgeries (Barber, Click & Weidman, 1998).

According to New Choice Health Arthroscopic (2016) shoulder surgery can fluctuate in costs depending on where that individual resides. Typical arthroscopic surgeries costs across the country are as follows:

Dallas, Texas: \$3,900-\$10,600
 Miami, Florida: \$4,100-\$11,200
 Atlanta, Georgia: \$3,700-\$10,200
 Chicago, Illinois: \$4,100-\$11,1000
 Los Angeles, California: \$5,800-\$15,900
 New York, New York: \$4,500-\$12,300
 Houston, Texas: \$3,900-\$10,600
 Phoenix, Arizona: \$4,400-\$11,900
 Philadelphia, Pennsylvania: \$4,400-\$12,000
 Washington, DC: \$4,300-\$11,800 (New Choice Health, 2016)

New Choice Health also reports that the Shoulder Repair Cost National average is \$6,500-\$41,300; a Rotator Cuff Surgery Cost on average ranges from \$8,400-\$56,200 (New Choice Health, 2016). The varying costs all depend on the variables, which can include but are not limited to; varying availability of equipment to do the surgery, whether the hospital is low, intermediate or a high volume center for surgeries, or the surgeon (Churchill & Ghorai, 2010).

The preoperative and postoperative care of caring for an athlete before and after surgery are almost as time intensive and expensive as the surgery itself. An average annual charge for a Big Ten Collegiate Baseball team showed a \$37, 632.57 cost, which averaged out to \$1, 045.35 per athlete with only 26 claims, there is a huge expenditure that is taken out on each of those injuries with an NCAA roster cap that is set at 35 baseball athletes (Kaeding et al., 2014).

The NCAA has done extensive Injury Surveillance for many different sports and the types of injuries that are involved with that certain sport. The NCAA performed a review of descriptive epidemiology of collegiate men's baseball injuries that has helped to highlight the reoccurrence of shoulder injuries during baseball practices and competitions. The NCAA recognized that the most injuries occur at the higher competitive level of Division I and trickles down to a lesser amount into the less competitive baseball programs that exist at the Division II and III level (Dick et al., 2007). The Injury Surveillance Program collected numerous amounts of information regarding injury that occurs within baseball and an astounding 45% of all injuries recorded from 1988-1989 through 2003-2004 were to the upper extremity (Dick et al., 2007). Of those upper extremity injuries 32.2% of those were to the shoulder in both competitive games and scheduled practices (Dick et al., 2007). During competition the frequency and types of shoulder injuries are as follows; muscle-tendon strain at 6.5% occurrence, tendonitis at 2.7% occurrence, dislocation at 2.3% occurrence, and ligament sprain at 1.4% occurrence (Dick et al., 2007). During practices the frequency of each injury came at muscle-tendon strain 10.0% occurrence, tendonitis at 6.7% occurrence, dislocation at 1.5% occurrence, and ligament sprain at 1.1% occurrence (Dick et al., 2007). The rate at which shoulder injuries seemingly happen throughout games are a huge factor in determining the expenses that can come from a baseball season. Not only are these injuries detrimental initially, but many of these injuries can be

prolonged and the costs that arise from each of these can be hardening on the sports medicine budget along with the athletic departments budget.

Collaborative studies have been able to show that major shoulder injuries that occur while participating in baseball have resulted in a significant amount of time lost from participation (Yang, Tibbetts, Covassin, Cheng, Nayar & Heiden, 2012; Dick et al., 2007; McFarland & Wasik, 1998). Yang et al. (2012) noted that 17.6% of shoulder overuse injuries resulted in the most time that was lost from participation in a collegiate sport.

According to the NCAA Injury Surveillance Program, shoulder injuries that occurred were the leading injury that held an athlete out for ten or more days. (Dick et al., 2007). The majority of these severe injuries occurred during practice (Dick et al., 2007). During competition there was a 6.2% occurrence of muscle-tendon strain that occurred and during practices a noteworthy percentage of 14.2% of muscle-tendon strain and 7.9% of tendonitis occurred in which the baseball athlete was out ten plus days (Dick et al., 2007). The NCAA also reported that baseball athletes that sustained a severe shoulder injury that kept them out for ten days also kept the athlete out for more than 21 days (Dick et al., 2007).

Respectively, the NCAA Injury Surveillance Program shows that out of the 45 % of upper extremity injury, 39.4% of all injuries these injuries occurred were to the shoulder complex (Dick et al., 2007). During the sixteen year reporting period 1,623 shoulder injuries were recorded with 59.5% of those were associated with throwing (Dick et al., 2007). Out of those 1,623 shoulder injuries, pitching accounted for 709 of those injuries (Dick et al., 2007).

Similar studies have been able to collaborate data alongside the NCAA Injury Surveillance Program and painstakingly find the same information; the shoulder in baseball is one of the most highly rated injuries that can occur during play, whether it be a competition or

practice. McFarland & Wasik (1998) monitored a Division I Intercollegiate baseball team where they were able to find that more than half of the injuries that occurred during a three year time period were to the upper extremity, occurring at 58%. “The shoulder was the single most common body part for which players sought evaluations, and it was also the body part resulting in the most injuries” (McFarland & Wasik, 1998, p. 11). The average amount of lost time when surgical cases were omitted from a shoulder injury was 7.6 days (McFarland & Wasik, 1998). However, when the surgical cases are added into the average the days missed amounts to 24.3. Over 363 games and 320 practices were missed from shoulder injuries. Rotator cuff tendonitis was amounted as the most detrimental injury that was reported by the athletes within this study with 15 pitchers, 1 catcher, 16 infielders, and 11 outfielders reporting this injury over the three year period; relating back to the NCAA Injury Surveillance with 9.5 % of injury occurring from shoulder tendonitis (McFarland & Wasik, 1998; Dick et al., 2007). With 69% of pitchers, 19% of infielders, and 19% of outfielders representing this rate of injury it is very apparent that injury is not only excluded to the pitching arm (McFarland & Wasik, 1998).

Laudner & Sipes (2009) highlighted subacromial impingement as an injury that put the baseball athlete at high-risk for lost time during participation. They found that out of the 371 overhead athletes that were analyzed 126 of the injuries that were reported were done so by baseball athletes making up 33% of all shoulder injuries that occurred within this study (Laudner & Sipes, 2009). They also found that rotator cuff tendonitis accounted for 19% of shoulder injuries, which was congruent with previous mentioned studies (McFarland & Wasik, 1998; Dick et al., 2007; Laudner & Sipes, 2009).

Oyama et al. reported that out of 629 collegiate pitchers that replied to their 2014 survey reported that 51.8% (326 pitchers) had a lifetime history of shoulder or elbow injuries. A total of

171 pitchers reported 192 shoulder injuries, of these 131 resulted in surgical intervention (2014). These statistics show that one in every five pitcher needed surgical intervention in order to correct their injury (Oyama et al., 2014). After these surgeries, athletes are not only faced with a long return to play recovery time, but also run the risk of other shoulder injuries due to altered glenohumeral arthrokinematics, thus putting the baseball student-athlete in another injured state, prolonging return to play and added medical expenses (Oyama et al., 2014). These shoulder injuries were all reported to have been sustained after the age of 18, which most of the cost of the surgeries on institutions such as universities where that baseball student-athlete is participating (Oyama et al., 2014).

The NCAA Injury Surveillance Program reports that baseball is one of the lowest injury rates occurring during participation. However, over 25% of the reported injuries resulted in a loss in activity time of ten or more days. These findings warrant consideration on how to prevent shoulder injuries from occurring at such a rapid rate (Dick et al., 2007). With the collective research showing that shoulder injury is one of the leading causes of injury in the baseball athlete, the need to implement preventative rehabilitation for the shoulder is more than apparent when it comes to lowering the costs of medical care. Laudner & Sipes emphasize a need for prevention techniques in order to decrease the incidence of chronic shoulder injuries among overhead athletes. They believe that early detection of predisposing factors can limit certain injuries that may occur. This would inevitably help to decrease the time lost from competition, costly medical expenses, and surgical intervention (Laudner & Sipes, 2009).

Hootman, Dick & Agel (2007) also express “that there is a critical need to train researchers in the appropriate methods and to increase funding for injury prevention research in the United States” (p. 315). The data that has come from injury surveillance and previous

research can highlight “potentially modifiable factors that, if addressed through injury prevention initiatives, may be able to reduce injury rates” (Hootman, Dick & Agel, 2007, p. 319). If sports medicine teams are able to understand where overuse and acute injuries are happening and the potential risk factors that predispose the student-athlete to injury they “can facilitate efforts to prevent these injuries, as prevention is the best treatment for both the athlete and the team, and it decreases the financial burden of collegiate athletics on the institution” (Kaeding et al., 2015, p. 72). Ultimately,

sports-related injury or illness is best treated by prevention. A better understanding of sport-specific medical expenses will facilitate our efforts to maximize the care of our athletes by helping us to understand where additional resources may be needed to prevent injury as well as decrease our health care costs (Kaeding et al., 2015, p. 76).

Since the baseball athlete exposes their shoulder to a multitudes of stressors that many other athletes and non-athletes do not experience, the benefits of a preventative injury shoulder program could greatly inhibit the rate of injury that the baseball athlete may experience during their career. The shoulder must “exhibit excessive motion along with extraordinary strength and neuromuscular control to throw a baseball” (Wilk, Reinold & Andrews, 2009, p. 413). In order for the baseball athlete to avoid injury the shoulder must be properly conditioned in order for the shoulder complex to display full range of motion all while avoiding injury (Wilk, Reynolds & Andrews, 2009).

Risk factors that predispose the baseball athlete can be predetermined at a young age, or they may develop as the baseball athlete ages and gets further into their career due to the development of their throwing arm and/or mechanics. The baseball athlete is exposed to the risk of injury at a young age; “shoulder strengths and motion deficits in high school baseball pitchers

have been implicated in injury risk” (Tyler, Mullaney, Mirabella, Nicholas & McHugh, 2014, p. 1993).

Baseball athletes are found to be subject to injury based off of the loss of glenohumeral internal rotation range of motion, this type of deficit begins to affect baseball athletes at a young age, specifically pitchers (Tyler et al., 2014). The baseball athlete experiences a decrease in internal rotation every time that a baseball is thrown which in turn decreases the range of motion that is available to the shoulder complex during the throwing motion. This creates a shortened throwing motion that the shoulder complex must fight against in order to continue to throw at such a high velocity (Tyler et al., 2014). This deficit in internal rotation range of motion can result in posterior capsular tightness, which causes the humeral head to migrate anteriorly during overhead motion (Wilk, Reinold & Andrews, 2009). Posterior shoulder tightness has been shown to cause shoulder injury in the baseball pitcher (Tyler et al., 2014).

The baseball athlete already puts a large amount of stress on the posterior shoulder when the arm decelerates during the follow-through phase of the throwing motion (Laudner, Moline & Meister, 2010). Therefore an athlete that has added posterior shoulder tightness added to the existing stressors on the posterior shoulder from the throwing motion the effects can lead to a break down in the shoulder complex. Over the years the repetitive stress that is put on the shoulder complex from this chain of events can create an anatomical position that will begin to change the shoulder complex (Laudner et al., 2010; Tyler et al., 2014). Many different adaptations occur in the throwing shoulder and will eventually lead to changes in the bone and soft tissue due to the repetitive activity that is experienced during the throwing motion and the altered anatomical position that is created (Laudner et al., 2010). When there is an imbalance in muscular strength and range of motion deficits there can be an irregular movement of the

glenohumeral joint that may predispose the athlete to a multitude of injuries (Laudner et al., 2010).

After predetermining the effects of decreased range of motion of the glenohumeral joint and muscle weakness in the shoulder complex, a sports medicine team can clearly prescribe a shoulder maintenance program that will help decrease shoulder injury. There are many different components that must be included in an injury prevention shoulder program that will defeat weaknesses, imbalances and altered stability when in the static state (Reinold, Gill, Wilk & Andrews, 2010).

One of the most important components that must be covered within a program is to maintain total throwing range of motion throughout the whole entire season. As previous studies have shown there is a loss of internal rotation within the glenohumeral joint every time that a pitch or throw is thrown (Reinold et al., 2010; Ruotolo, Price & Panchal, 2006; Myers, Laudner, Pasquale, Bradley & Lephart, 2006; Tyler et al., 2014). A proper injury prevention shoulder program looks to reduce the loss of internal rotation and maintain a “thrower’s motion” at the glenohumeral joint (Reinold et al., 2010). The throwing shoulder should be compared bilaterally and the amount of range of motion should equal the amount of the non-dominant arm, even if the amount of either external or internal range of motion differ, the total amount of range of motion should still be equal (Reinold et al., 2010). The baseball athlete can exhibit anywhere from 183 degrees to 198 degrees of total external and internal range of motion (Reinold et al., 2010). The loss of either of these as specified above correlates with an enhanced chance of injury (Reinold et al., 2010). In order to try and prevent the loss of external and internal rotation of the shoulder it is important to incorporate a stretching component to the shoulder program.

The second component that is necessary to be included in an injury prevention shoulder program is strengthening. Since the amount of stressors that are put on the shoulder complex are so taxing, the musculature of the shoulder must be able to compete against the forces of the throwing motion. According to electromyographic studies that focused on strengthening the external rotators, scapular retractors, and the lower trapezius will benefit the baseball athlete immensely when working to prevent injury (Reinold et al., 2010).

The third component within an injury prevention shoulder program is an emphasis on neuromuscular control (Reinold et al., 2010). The shoulder goes through a wide range of motion throughout the throwing motion and if there is not enough neuromuscular control to stabilize the shoulder an injury can result. Neuromuscular control is not only limited to the glenohumeral joint, but also needs to be applied to the scapulothoracic articulation since it provides such a large base of musculature attachment for the whole entire shoulder complex.

After review of NCAA regulations of healthcare for student-athletes, healthcare costs themselves, the rate at which injury occurs in the baseball student-athlete at the collegiate level, predisposing conditions to shoulder injuries, and important benefits of an injury prevention shoulder program we can use these components to analyze fully the benefits that one NCAA Division I Intercollegiate Baseball team experienced by the utilization of an injury prevention shoulder program. These benefits ranged from decreased insurance premiums to decreased injury; this sole purpose of this research though was to analyze how the injury prevention shoulder program reduced the financial burden on the athletic department's healthcare premium.

Purpose

Division I intercollegiate athletics have become increasingly popular over the past couple of decades and are ever growing. With the heightened competitive level there comes an urgency

of an athlete to push themselves to their body's breaking point, which inevitably will result in an injury. An injury that requires therapy and could produce an immense number of medical expenses, which increase insurances premium with each added injury.

The high rate at which shoulder injury occurs at the collegiate level has been slowly increasing and does not show any signs of decreasing as the level of competitiveness escalates in collegiate baseball. As the previous research shows, the ability for a sports medicine team to incorporate an injury prevention program for the shoulder could assist in decreasing debilitating costs from high insurance premiums that athletic departments have been experiencing over the past few years. A NCAA Division I Intercollegiate baseball team was found to not have an injury prevention shoulder program in place and the rate of shoulder injury amongst their baseball team was occurring at a high rate. This particular institution began incorporating an injury prevention shoulder program for their baseball student-athletes at the beginning of their 2014 fall ball season. The baseball student-athletes were instructed and overseen by the Graduate Assistant Athletic Trainer in order to properly implement the proper techniques and movements to strengthen the shoulder complex as a whole. The baseball student-athletes performed this program three times a week up until their spring 2015 season where the baseball student-athletes at that point were given instruction to follow the shoulder injury prevention program according to their pitching rotations. This varied on whether the athlete was a starter or bullpen pitcher. This protocol was also followed for the 2015 fall ball season and is presently being applied to the 2016 spring season.

The shoulder program that was utilized at the particular NCAA Division I baseball program included a variety of different strengthening, stretching and neuromuscular control components. As previous research shows in the above Review of Literature, these are the

components that are necessary to incorporate into a proper injury prevention shoulder program. With the utilization of all three components, the institution's baseball team was able to have a varied program that targeted all possible weaknesses that could potentially cause injury during the participation in the sport of baseball. The injury prevention shoulder program that was implemented was approved by both the Head Baseball Coach and the Pitching Coach that are currently on staff at the Division I institution. In order to maintain a record of the pitchers that performed the injury prevention shoulder program, they were recorded on a sign-in sheet by the Graduate Assistant Athletic Trainer that covered the baseball team.

This particular injury maintenance shoulder program was put into place after realization that there was a shoulder injury prevalence amongst this particular NCAA Division I institution. These injuries resulted in obvious discomfort to the student-athlete, lost playing time and increased expenditures when caring for the baseball student-athlete. After this was determined an injury prevention shoulder program was put into place to try and help curb the instances where shoulder injuries did occur that could have possibly been prevented.

After reviewing insurance premiums that were available from 2012 to the spring of 2016 this research was able to pinpoint claim experience and was able to determine the percent that was related to baseball injuries.

Records were kept in the Staff Authorization Codes for Insurance and their Sports Injury Maintenance System (SIMS) for this NCAA Division I University. By using present information on injury surveillance and comparing it to the past four years of injury information within the sports medicine's system it is our objective to show that an injury prevention shoulder program is valuable to an Athletic Department by decreasing medical expenses that increase insurance premiums.

Methods

In order to access the insurance information and past injury information permission was granted from the NCAA Division I's Sports Medicine Director and the Associate Athletic Trainer that is also the Insurance Coordinator for the sports medicine department.

The injury records maintenance system that this particular institution used in the past had been created specifically for their sports medicine department, however as of August 2014 the institution switched over to a software system that was more compliant to their needs. This system was called the Sports Injury Maintenance System. This caused a loss of access to any specific records of shoulder injuries that were accessible by using the old system, thus the Staff Authorization Codes that are used to track the insurance payments was used to identify shoulder injuries for the years 2012-2013, 2013-2014, 2014-2015 and 2015-2016.

The insurance information that was provided was tracked from 2012-2013, 2013-2014, 2014-2015 and 2015-present. For the years 2012-2013, 2013-2014 and 2014-2015 the provider that was used for this particular NCAA Division I institution was Aetna and 2015-2016 they utilized Ameriben.

Results

After review of the data, the results showed that there was a decrease in the amount of shoulder injury after the injury prevention shoulder program was implemented, thus decreasing the medical expenses that were spent on shoulder injuries for the baseball student-athlete. From the years 2012-2013 no baseball student-athletes made a claim for a shoulder injury; 2013-2014 four baseball student-athletes required claims for a shoulder injury; in 2014-2015 three baseball student-athletes required claims and since the fall of 2015 there have been no claims made in reference to a shoulder injury. After reviewing the amount of shoulder injuries that occurred over

that four year period, we were able to associate them with the premium costs that had been determined from 2012-present.

This particular NCAA Division I institution has seen a relative drop in the amount of expenditures that it has had to pay on shoulder injuries since the years where an injury maintenance shoulder program did not exist. However, there has been an increase in the premium, which has other pre-existing factors that do affect the rise, such as seventeen other collegiate sports that require use of the secondary insurance. As this data shows there has been an instrumental increase from the years 2012-2016 in the amount of money the sports medicine department has been required to cover in costs of premiums. However, there must be attention paid to that there is seventeen other collegiate sports that partake at this institution and utilize this secondary insurance. So therefore to determine the expenses that come individually from baseball a breakdown of where the medical expenses come from was taken from both Aetna and Ameriben.

There was no need to complete an expense break down for the years 2012-2013 as there were no claims filed for a baseball student-athletes shoulder injury. In 2013-2014 there were six claims made that filed under a baseball student-athlete with four of those claims being shoulder; \$5,237 was paid out on all six claims, meaning that 66% of that was spent on shoulder injuries which roughly is \$3,456 spent on shoulder injuries to the baseball athlete. For all eighteen collegiate sports together in the time period of 2013-2014 \$7,133 of medical expenses came from the shoulder. This accounts for 2.8% of the expenses that the insurance company paid out. In 2014-2015 baseball had three claimants that all involved a shoulder injury, which totaled medical expenses to be paid by the insurance company at \$6,646, which made up a total of 3.2% paid towards the baseball student-athlete. This time period accounted for a total of twelve shoulder

injuries spread out amongst the eighteen sports making up 35.7% of the costs paid, putting the total medical expenses for shoulder injury at \$74,465. The largest increase in premium was seen within the current year of 2015-2016 which presented a 44% increase within the premium. However, by looking at the cost break down, the data shows that there was not one dollar spent on a baseball student-athlete claim with a shoulder injury. This shows that there is no additive medical expense cost due to a shoulder injury that was experienced by a baseball student-athlete. The increase in premium was due to the other seventeen sports having a high average of injury and limited health insurance that was able to cover a large amount of the costs thus increasing the premium for the Ameriben insurance coverage.

Discussion

These results show there is indeed a positive correlation between the use of an injury prevention shoulder program and decreasing the amount of medical expenditures experienced by the baseball student-athlete. As stated in the above Literature Review, the shoulder is prone to injury within the sport of baseball and by having a preventative program for shoulder injury can be extremely beneficial. The data shows that the years that there were multiple shoulder injuries experienced by the baseball student-athlete, there were evident costs that were added to the insurance premium as a whole. Although this percentage seems minimal when compared to a high-collision sport and large roster such as a football team that can produce a 44.9% total medical expenditures cost (as it did at this particular NCAA Division I institution), the amount of cost that comes from a small roster and non-contact sport such as baseball produces a large amount of unnecessary cost.

This particular NCAA Division I baseball program that was studied showed that they were fully representative of their student-athletes in the sense that they picked up any leftover medical costs that were experienced after an injury. This is a huge burden to the sports medicine department's budget as when a student-athlete does not have a proper primary insurance plan than the institution is left to cover 100% of the costs. This leaves a high cost whenever there is a serious injury.

Baseball is now one of the most popular team sports in the United States with more than 18 million youths actively participating (Janda, 2003). This is a large amount of the current population that is exposing themselves to a possible shoulder injury. These individuals begin playing as early as 5 years old, however the majority of shoulder injuries that do occur, happen after the age of 18. This puts those baseball athletes in their college years, which leaves the institutions that they participate at with the rising costs of medical expenses when they experience an injury. With the increase in shoulder injuries that are occurring and the rising costs of healthcare the instances that an injury prevention shoulder program are becoming necessary are quite evident at the Division I level. The NCAA Injury Surveillance System collectively identified over their 16 year time period study that out of the 45% upper extremity injuries that occurred, 39.4 % occurred within the shoulder complex (Dick et al., 2007). They were also able to report 1,623 shoulder injuries were recorded with 59.5% of those associated with the action of throwing (Dick et al., 2007).

This significant amount of shoulder injuries that the NCAA Injury Surveillance Program reports almost presents an epidemic to the collegiate baseball world. The amount of individuals that participate in baseball at the collegiate level rounds up to about 27,000 student-athletes that are putting themselves at risk for a shoulder injury. With the excessive stressors that is put on the

shoulder complex through the throwing motion, it is imperative that a proper injury prevention shoulder program contains all of the components that could possibly help decrease the risk of shoulder injury to the baseball student-athlete. If a sports medicine team can identify predisposing factors within their baseball student-athletes, they will more than likely be able to implement an injury prevention shoulder program that can help to reduce the risk to the student-athlete. This will evidently reduce the amount of money that is spent on medical expenses when treating a student-athlete with a shoulder injury.

The above results make it visible that when shoulder injuries do occur the insurance premium is indeed increased, and when shoulder injuries are minimized, when there are no other major contributing factors can be decreased. All in all this data can show that decreased injury can evidently decrease the amount of expenses that are spent on the baseball student-athletes' shoulder injuries.

Conclusion

The shoulder complex is one of the freest moving joints within the human body. With the large amount of motion that the shoulder complex is capable of, however, comes a greater risk of instability and injury. In order for the shoulder complex to maintain a consistent and pain free range of motion it must always have an arthrokinematic motion that operates without interruption. The shoulder must undergo an immense amount of stress throughout every action and even more so when the individual is active. The baseball athlete is one of the most distinguishable individuals that puts an incredible amount of stress on the shoulder complex. This is due to the repetitive movements that are experienced through the throwing motion. This motion occurs at an abnormal amount of speed and force that the shoulder complex is not naturally used to, which in return puts an enormous amount of stress on the complex. Without

the proper care of the shoulder complex, there will be a point where the shoulder cannot deal with the amount of stress from the repetitive motions of throwing. This in turn causes the shoulder to break down, causing an injury to the athlete. This amount of breakdown that occurs within the shoulder complex has been seen largely in the population that is ages 18 and above, thus placing them at the collegiate level.

After the baseball athlete experiences this injury there is a large amount of time and care that has to be put into the student-athlete in order to return them to play. This will require large medical expenses that become quite the burden on the athletic departments. This is largely in part because of secondary insurance that is applied to the student-athlete to avoid out of pocket costs when it comes to paying for an injury that occurs while participating in a NCAA sponsored baseball practice or competition.

Limitations

This research study did have limitations that were caused by a change in software at this particular institution. With the limited amount of information on the amount of shoulder injuries that were not accounted for on the insurance claims may have had an effect on the results. Future research should not only look into the amount of money that is spent on insurance premiums but also the amount spent of modalities, pre-operative and post-operative care.

Bowling Green State University Plan of Action

From this research came valuable information that will be used in order to implement an injury prevention shoulder program at Bowling Green State University's Baseball Pitching Program. Appendix A shows a detailed description of what the injury prevention shoulder program will include. Appendix B shows how each component will be applied to the varying start days of the pitchers. Appendix C shows the support of Rick Blanc, Bowling Green State

University's Pitching Coach, for the injury prevention shoulder program. Appendix D shows the support of Daniel Fischer, Associate Athletic Trainer & Insurance Coordinator, for the injury prevention shoulder program.

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Appendix A

PROGRAM 1

1. STANDING SCAPTION AT 160 DEGREES
2. STANDING ABDUCTION AT 90 DEGREES
3. WALL SCRUB
4. SERRATUS PUNCH

EACH MOVEMENT IS DONE FOR 2X15

*SLEEPER STRETCH: 3X1 MINUTE

PROGRAM 2

1. PRONE PALM DOWN ABDUCTION AT 90 DEGREES
2. PRONE THUMBS UP AT 135 DEGREES
3. PRONE EXTENSION AT 45 DEGREES
4. PRONE 90/90
5. CROSS BODY PULL WITH THERABAND

EACH MOVEMENT IS DONE FOR 2X15

*SLEEPER STRETCH: 3X1 MINUTE

EXTERNAL AND INTERNAL ROTATION PROGRAM

1. ACTIVE RESISTED EXTERNAL ROTATION
2. ACTIVE RESISTED INTERNAL ROTATION
3. SIDE-LYING EXTERNAL ROTATION
4. SIDE-LYING INTERANAL ROTATION
5. INTERNAL ROTATION IN 90 DEGREES
6. EXTERNAL ROTATION IN 90 DEGREES
7. SUPINE EXTERNAL ROTATION

EACH MOVEMENT IT DONE FOR 2X15

SLEEPER STRETCH: 3X1 MINUTE

BODY BLADE PROGRAM

1. 90 DEGREES ELBOW FLEXION, 90 DEGREES SHOULDER ABDUCTION
2. 90 DEGREES SHOULDER ABDUCTION
3. DIAGONAL THROWING MOTION
4. 90 DEGREE SHOULD ABDUCTION 90 DEGREE ELBOW FLEXION IN TRANSVERSE PLANE

EACH EXERCISE IS DONE 2X45 SECONDS

SLEEPER STRETCH: 3X1 MINUTE

Appendix B



Starting Pitcher's Running/Throwing/Bullpen Schedule

STARTERS

Game Day: Regular warm-up routine, tubing, 2 poles, 4 30yd sprints, Plyometrics, stretching, (should have a sweat started before you even start throwing), 120-150+ ft. throwing warm-up. After game 25 min. of cardio (bike or elliptical). Endurance Shoulder Strengthening Program

Day After Start: 20-30 min. run (20+poles), preference throwing or light "stretch" toss (no aggressive throwing) 90-120ft., abs/medicine ball, Forearm Workout, Flush Massage with ATC

2nd Day After Start: 14 poles, 8 sprints (40 yds.), light "stretch" toss 120-150+, abs/medicine ball, Shoulder Program 2

***3rd Day After Start:** regular "aggressive" throwing 120+, 8 poles, 12 explosion sprints (20 yds.), *Flat Ground pen (30 pitches), abs/medicine ball, Body Blade Workout, Internal and External Shoulder Workout

***4th Day After Start:** 4 poles, 10 half pole sprints, abs/medicine ball, Internal and External Shoulder Workout

Bullpen Day: Regular "aggressive" throwing 120+, Light 30 pitch spot pen, 14 poles, abs/medicine ball, Program #1 or #2

Day Before Start: Preference throwing, 4 poles, 6 half pole sprints, abs, Body Blade Workout, Internal and External Shoulder Work

*If applicable (depends on when your next start will be)



Relief Pitcher's Running/Throwing/Bullpen Schedule

RELIEVERS

Game Day(if available): 120-150+ light "stretch" throwing, 2 poles, 4 half pole sprints, Program 2 if not thrown. Endurance Shoulder Strengthening Program if thrown.

Game Day(if shut down): Preference throwing (if you throw over 50 pitches day before), 90-120+ "stretch" throwing if below 50 pitches), 4 poles, 8 half pole sprints, abs/medicine ball, Program 2, Forearm workout

Non Game Days(game the next day): 4 poles, 8 half pole sprints, abs/medicine ball, Body Blade Workout, Internal and External Shoulder Workout

Non Game Days(no game the next day): 150+ long "aggressive" toss, 10 half pole sprints, 20 min. bike/elliptical, abs/medicine ball, Program #1 or #2, Forearm Workout.

Bullpen(light spot 30 pitch max): *If you haven't thrown in 3 days.

*If third day is game day, throw your bullpen after (or towards the end) of the game if you don't pitch in the game. Body Blade Workout, Internal and External Shoulder Workout

*****Always "Listen to the arm" when going through these step**

******Relievers will bike/elliptical for 20 minutes after they throw in a game.**

*******If you need to get to game early to get your workout in make sure to do so.**

*******All bike/elliptical workouts after throwing will be done in the locker room, BEFORE you leave for the day.**

Appendix C



To whom it may concern:

I am writing this recommendation for the shoulder program that our pitchers here at Bowling Green State University have been on for the past two seasons. During a meeting with our ATC before the 2014 fall season, I felt very comfortable putting the program total control of her to monitor the arm care program for the pitchers.

This program has been in my opinion the reason our staff has stayed for the most part serious injury free. It is very in depth and monitored by our ATC on a daily basis. It is tailored for three different levels, fall, winter and spring. During our "fall training season" which entails performance (at a lighter work load) and strength training. Our "winter program" works closely alongside our strength and conditioning program. The spring portion of the program is our "full in season" program. This is the portion of the program that is very in depth. The program is scheduled on a daily chart for our starting pitchers and the on another chart for our relief pitchers. The reason that it is structured this way in to accommodate the different schedules the relievers have in regards to games and when they throw live. Starters are on a set schedule that doesn't vary, for the most part they pitch on the same day each week and do the program as laid out by the ATC and pitching coach.

I am in strong belief that this program is the reason for the limited injuries. I also feel that this program enables our guys to recover quicker from throwing sessions and games. They are able to take on a heavier throwing workload therefore making them stronger. We have seen increases in velocity in some of our pitchers along with a lower walk ratio per nine innings as a staff in whole.

Sincerely,

Rick Blanc

Associate Head Coach

Bowling Green State University Baseball

MAC CHAMPIONS 1972, 1995, 2002, 2008, 2009
 EASTERN DIVISION CHAMPS 1998, 1999, 2001, 2002, 2008, 2009, 2010
 MAC TOURNAMENT 1994, 1995, 1998, 1999, 2001, 2002, 2005, 2008, 2009, 2010, 2011, 2013
 TOURNAMENT CHAMPS 1998, 1999, 2013
 NCAA REGIONALS 1972, 1998, 1999, 2013

"FALCON PRIDE & DEDICATION"

BGSU Baseball Office • Bowling Green, Ohio 43403 • (419) 372-7065

Appendix D



Stated by Assistant Athletic Trainer and Insurance Coordinator Daniel Fischer:

"Preventive maintenance programs, such as, shoulder strengthening programs are a fantastic tool for the athletic trainer to utilize to reduce injuries throughout the season. Not only will these preventive programs keep players on the field, it will consequently reduce insurance claims due to injury. Being able to reduce claims experience will results in a reduction to the yearly premium an athletic department will pay for secondary insurance. It is truly a win-win for most importantly the athlete, but also the athletic department as a whole."

