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Sports Medicine and Ethics

Daniela Testoni, MD[1,2], **Christoph P. Hornik, MD, MPH**[1,3], **P. Brian Smith, MD, MHS, MPH**[1,3], **Daniel K. Benjamin Jr., MD, PhD**[1,3], and **Ross E. McKinney Jr., MD**[3,4]

[1]Duke Clinical Research Institute, Durham, NC

[2]Division of Neonatal Medicine, Universidade Federal de São Paulo, SP, Brazil

[3]Department of Pediatrics, Duke University Medical Center, Durham, NC

[4]Trent Center for Bioethics, Humanities, and History of Medicine, Durham, NC

Abstract

Physicians working in the world of competitive sports face unique ethical challenges, many of which center around conflicts of interest. Team-employed physicians have obligations to act in the club's best interest while caring for the individual athlete. As such, they must balance issues like protecting versus sharing health information, as well as issues regarding autonomous informed consent versus paternalistic decision-making in determining whether an athlete may compete safely. Moreover, the physician has to deal with an athlete's decisions about performance enhancement and return to play, pursuit of which may not be in the athlete's long-term best interests but may benefit the athlete and team in the short term. These difficult tasks are complicated by the lack of evidence-based standards in a field influenced by the lure of financial gains for multiple parties involved. In this article, we review ethical issues in sports medicine with specific attention paid to American professional football.

Keywords

sports medicine; ethics; conflict of interest; sports; football; athletes

Introduction

The world of competitive sports faces unique medical ethics issues that are not well explored in the medical literature. At the core of many of these issues are conflicts of interest: the club as both the provider of medical care and the employer; the players' competitive desires versus their own best medical interests; and the relative cost of injury prevention versus short- and long-term morbidities.

An athlete's autonomy and the physician's role in promoting health can sometimes stand at odds with one another. What are the rights of the player to accept risk? How much autonomy should the individual player have to return to play when there are serious risks of further injury, particularly if his judgment is impaired after head trauma on the margins of

*Corresponding author: Ross E. McKinney, Jr., MD, Professor of Pediatrics, DUMC Box 3461, Duke University Medical Center, Durham, NC 27710; phone: (919) 668-9000; ross.mckinney@duke.edu.

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concussion? In the heat of the moment, the individual athlete may be ill-equipped to decide, yet under pressure from peers and coaches to re-enter the game. What role should the team physician play in this decision-making?

There is no universally accepted code of ethics addressing these issues (Johnson 2004); however, some sports organizations have implemented their own ethics codes. For instance, the International Federation of Sports Medicine (FIMS) ethics code states: “It is the responsibility of the sports medicine physician to determine whether the injured athletes should continue training or participate in competition” (FIMS 2009). The organization’s code does not cover all ethical questions, however, and therefore discussions in this field are needed to help team physicians provide the best care to athletes and to create the basis for more effective ethical decision-making in sports medicine.

As a convention in this manuscript, because of our focus on football, we use male pronouns, but the issues we address are increasingly relevant for physicians and women in a variety of sports, particularly at a professional level.

Medical care issues

Conflict of interest

The aim of a physician as a provider of medical care is to promote, maintain, and restore human health (World Health Organization 2012). In sports medicine, however, a distinction is made between an athlete’s personal physician and the team physician. The personal physician cares for an athlete’s health as a primary obligation. The goal of the team physician is to take care of the “team’s health” and ensure that the athletes are fit to compete (Bernstein et al. 2000). Conflicts of interest originate when the athlete’s ability to compete and his personal health are not promoted by the same interventions (Polsky 1998). In fact, the team’s success and the athlete’s health are often not compatible (Dunn et al. 2007). As a club employee, the success of the team physician may rely on the success of the team and his or her ability to keep players on the field, which may mean advocating for short-term gains at the risk of long-term consequences. Frequently, the physician becomes a fan of the team, taking pride in being “on the team” and wanting to see it succeed (Stovitz and Satin 2006). The types of decisions that must be made by the athlete–team–physician triad generate important ethical conflicts in sports medicine. While many team physicians’ actions are influenced by this conflict of interest, those related to the areas of confidentiality and decision-making are arguably the most important.

Confidentiality (when the team physician is a team employee or contractor)

Medical students learn that confidentiality is a critical element of the doctor–patient relationship. Patients freely disclose information to their doctors because they trust that the information will be held in confidence (Tucker 2004). Physicians respect patients’ confidentiality except in situations of imminent danger to the patient or another person, or if required by law (Stovitz and Satin 2006). The team doctor, however, acts as an agent of the club and may handle information differently (Waddington and Roderick 2002). Team physicians dealing with professional sports, as club employees, typically have contractual obligations to share important information related to the athlete’s health with team management (Anderson 2008). In most cases, the dual nature of this relationship is understood by the athlete, although it can produce difficulties in the provision of optimal care. As a simple example, an athlete might not want to reveal a potential problem if it could result in his being “cut” from the team, regardless of the seriousness of the issue.

The privacy regulations of the Health Insurance Portability and Accountability Act (HIPAA) of 1996 established standards for protecting the security of patients’ health information

(HIPAA 1996). However, the information received in the care of professional athletes by team physicians may be considered part of the employment record and, as such, is not viewed as protected health information (PHI) (Magee et al. 2003). The privacy rule does not apply to employers, nor does it apply to the employment functions of covered entities when they are acting as employers (45CFR160 2002). For personal physicians who are not employed by the club or for evaluations and visits done in the physician's private office, however, the information is considered PHI, and HIPAA would apply (HIPAA 1996; Magee et al. 2003).

Even though in most cases there are no legal concerns, the sharing of what would normally be considered PHI with club management raises ethical concerns for the team physician. Although the athlete is informed that the team physician can share his health information, he may still hope the physician will keep his information private. The team physician sometimes ignores contractual obligations to maintain athletes' trust. An example given in the literature illustrates the complexity of the confidentiality issue:

> "A high school basketball star hoping for an athletic scholarship to college seriously injured his knee. He informed his physician that he intended to hide the extent of his injury, out of fear that it would affect his chances for a scholarship. Representatives of the team contacted the physician, inquiring about the status of the player's knee. Is it ethical to disclose this information without the consent of the player? On the other hand, would it not be equally unethical not to inform the team that they are about to give a scholarship to an athlete whose career is precarious at best?"
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> (Hyland 1979)

As it happens, the current HIPAA rules applied to this 1979 case are quite clear—that PHI should not be shared with outside parties without patient consent, but the ethical dilemma remains. Were this physician a professional team doctor, the outcome would be different, and the player might be cut from the team roster.

In a survey of sports medicine physicians, most respondents identified confidentiality as an area of potential ethical conflicts, mainly due to demands for information by coaches and management (Anderson and Gerrard 2005). When asked about the handling of sensitive information, team doctors stated that they had received information about recreational drug use, blood-borne infections, and the use of pain-relieving medication and performance-enhancing drugs (Anderson and Gerrard 2005). Half of the respondents stated they had disclosed the information to team management, while the other half stated that they had not (Anderson and Gerrard 2005).

Handling of sensitive information was also studied among English professional football (soccer) team physicians, physiotherapists, and players. Tape-recorded interviews demonstrated that health care providers working with athletes varied in the amount of player PHI that they passed on to managers (Waddington and Roderick 2002). From the answers given in the study, it is clear that there is a conflict between patients' interests and the club–physician relationship:

> "The problem is that I'm employed by the football club. I'm employed by the manager, and I'm supposed to be working with him, and if I withhold information which he thinks he should have, then he would say that I wasn't working for the club or for him, so it puts me in a difficult position…If I didn't divulge what I knew and then it came out afterwards, we're in hot water… If I thought it was beneficial to the club… that he should know, then I would say"
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> (Waddington and Roderick 2002).

The study showed that the health care professionals share information with the team management in varying ways, not only in terms of amount but also in terms of type of information (Waddington and Roderick 2002). All team physicians have similar contractual obligations. Why then, is there such diversity in how they handle confidentiality? This answer remains unclear, and more studies are needed to better understand this variation. Effective medical care depends on trust, and it is clear that inconsistent application of principles around privacy will not create a trusting environment.

Two opinions prevail regarding the sharing of information by the team physician with the team management. The first is that team physicians should keep confidential as much PHI as possible because, if the player loses trust in the physician, he will hide important information in the future (Waddington and Roderick 2002). The second is that the coach must know the health status of each player to best plan for the team's success (Anderson 2008).

If information sharing is unavoidable, athletes must at least be aware that PHI will be shared with other members of the team (Holm et al. 2011). The employment contract between athlete and club should always contain information on disclosure. Even if the athlete consents to disclosure of PHI in his contract, the team physician should remind the athlete that PHI can be passed to team managers (Bunch and Dvonch 2004).

Decision-making issues

The decision-making process in health care can be paternalistic, autonomous, or shared. In the past, a paternalistic approach was the most prevalent. The physician was considered the person in the best position to know the risks and benefits of treatment and should therefore make the decision for the patient (Charles et al. 1999). The evolution of medical ethics during the late twentieth century has led to a change in attitudes favoring the shared decision-making model over the paternalistic approach (Bunch and Dvonch 2004). Patients want to be informed of treatment alternatives and involved in the decision-making process (Guadagnoli and Ward 1998). In the shared decision-making model, patient and physician share information and decide together. Physicians must explain all treatment alternatives, their risk and benefits, while the patient needs to give the physician information about his interests, preferences, and cultural, social, and financial background (Charles et al. 1999). There is collaboration in the decision-making process, and both patient and physician agree with the chosen treatment (Charles et al. 1999; Whitney et al. 2004). The informed consent (autonomous) model involves the patient making an independent choice; the decision-making is unilateral, not shared (Whitney et al. 2004). The physician, in this model, has the role of explaining options for diagnosis and treatments and must accept the patient's decision (Meisel and Kuczewski 1996).

In sports medicine, external forces can influence the athletes' decision-making process. As an example, consider the case of a high school football player with recurrent knee pain diagnosed with a meniscal injury and offered the options of a non-operative treatment, arthroscopic partial meniscectomy, or arthroscopic meniscal repair (Ross et al. 2012). In the physician's opinion, a meniscal repair was the best option, with a lower risk of future knee osteoarthritis compared with the meniscectomy (Ross et al. 2012). A meniscal repair would require longer recovery, however, and the player would not play for the rest of the football season, thus perhaps losing the opportunity for a scholarship. He would likely not attend college without the scholarship (Ross et al. 2012). Should the physician decide for the patient in this case? Aware of the influences that team management, the public, and others can exert on athletes, some authors believe that sports physicians should be more paternalistic and make decisions for their patients (Bunch and Dvonch 2004). From this viewpoint, to impose limits on a player's autonomy is sometimes the only way to safeguard

his welfare (Sim 1993). For other ethicists, paternalism is unacceptable, and only the patient, if well informed, can decide what is best for him (Ross et al. 2012).

An athlete's decision-making capacity can also be influenced by the "team culture." The athlete can feel pressure from the coach, teammates, agents, and his own internal beliefs to do what's best for the team instead of focusing on his personal health (Dunn et al. 2007). Decision-making during a game or competitive event is even more difficult. The desire to return to the field may overpower the athlete's ability to comprehend the situation and make rational choices. The potential long-term consequences may not adequately factor into the athlete's decision-making in such heated moments (Bunch and Dvonch 2004).

Social and economic disparities are not the focus of our discussion, but it is important to remember that decisions are influenced by social and economic status. In the case noted earlier, for example, if a scholarship is the only way to enable the athlete to go college, the decision for a procedure with a slower recovery time may be very different than the same decision made by someone who can attend college without a scholarship. We could argue that physicians may have a role in helping to decrease social inequalities in this context, but should the physician fill that role?

Autonomy

In the context of sports medicine, autonomy is a well-discussed principle (Johnson 2008; Dunn et al. 2007; Bunch and Dvonch 2004; Gillon 1994). If a person can freely make a decision, even if he is not a good judge, the satisfaction of the free will generally exceeds the frustration of a bad decision (Bunch and Dvonch 2004). However, for a person to be considered truly autonomous, he must be able to remain free from controlling interferences (Sim 1993). An important ethical question in sports medicine is whether there are times when we should consider an athlete incapable of full autonomy, beyond the obvious case when he has suffered head trauma. In particular, in the context of a football game, are there reasons to limit the rights of the player to accept risk?

Football players often neglect their own health to stay in a game. A former NFL player was quoted as saying:

> "I wasn't going to let a simple concussion slow me down. So I screwed with my own test results to protect my spot in the lineup and on special teams. Looking back, it was one of the worst decisions I ever made, especially after experiencing a concussion in 2003 (one that knocked me out) and playing the next week in Carolina. I took the test during the practice week and was right back on the field. But I would probably do it again if it kept me on the roster"
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> (Bowen 2011).

The article titled "Playing to Win: How Much Should It Hurt" discusses the influence of the public, team management, and sportswriters on athletes' decisions involving injuries and the appeal of risk-taking in sports. Dan Pastorini, a football player, gained respect from many fans after being severely injured and continuing to play with a knee brace, heavily bandaged elbow, and flak jacket. On the other hand, Bill Walton, a basketball star who objected to taking pain killers to allow him to stay in the game, consequently had his strength of character questioned (Hyland 1979). The competitiveness of sport, the fact that athletes are told that they must be strong and brave, and the expectations of others are forces that increase the probability of bad decision-making. Desire for fame and/or for reward are also forces weighing on this decision (Hyland 1979). Is the athlete really free from controlling influences?

If we consider an athlete as truly autonomous, the responsibility to take risks is his own. In this case, what are the rights of the team management to limit the risks allowed for players? Should an injured player be back on the field against his team physician's decision if he wants to play? We should say "yes" if we consider the athlete to be autonomous and if he is well informed of all risks. The team physician should also have the right to forbid an athlete to play when he foresees a high risk/benefit ratio. But there are grey areas between the rights of the player to accept the risk and the right of the team management to limit risk for players. To choose a simple example, a team may prefer to limit the playing time for a concussion-prone player, while the player may feel fine at the present moment and desire to return to play. Whose liability is it if the player has another concussion, perhaps a severe one, when the team knew the player was taking what may have been perceived by outsiders to be an unacceptable risk?

Another factor affecting autonomy is the very hierarchical culture of most sports teams. The team management and the coaches make many decisions (where and whether a player will play, for example). This command-based norm creates a mindset of compliance with group expectations (e.g., a lineman won't choose to pass block on a running play, although it's his autonomous right to make that choice). When the time comes to decide whether to allow a player to return to the field, the coach is likely to have an important role, and players may not perceive they have full autonomy to opt out of returning.

Informed consent

Informed consent in health care includes making an adequate level of relevant information available for the patient to enable him to make a free and autonomous choice (Stoljar 2011). Informed consent and autonomy are closely related. The informed model of decision-making in sports medicine assumes that the athlete is autonomous and can balance the pros and cons of his choices (Bunch and Dvonch 2004). Physicians must obtain appropriate informed consent from all patients before treatment can take place. Consent for procedure-based risks must have four legal components to be valid: 1) the person must be deemed competent in decision-making; 2) the risks and benefits of the procedure must be thoroughly explained; 3) the patient must understand the explanation offered; and 4) the consent must be voluntary (Bunch and Dvonch 2004).

To improve informed consent, physicians should involve patients in decision-making, establish goals of care, encourage and check patient comprehension, and document the process (Hall et al. 2012). The consent form is an important tool to aid comprehension, if it's easily readable (Hall et al. 2012). In a study analyzing the readability of currently used surgical/procedure consent forms in the United States, the mean grade level required to understand the consent forms was 12.6 (± 3.1) (Hopper et al. 1998). Virtually all NFL players have been enrolled in college prior to playing in the NFL; therefore, level of education is not typically an obstacle to consent (Weir et al. 2009). However, the capacity to read the consent form is not enough; one must understand the nature of the information provided. The consent form is just one part of the informed consent process (Hopper et al. 1998).

A requirement for informed consent in sports medicine involves all treatment decisions during or after the game. Informed consent on the sideline is particularly complicated and is per se a topic for ethical debate (Johnson 2004). Even if a broad informed consent is obtained before the game, the athlete normally has the right of decision-making if he suffers an injury during the game. In this scenario, how adequate can informed consent be, particularly if the situation involves head trauma? Will the game situation unduly affect the medical decision-making? Should the team physician transfer the risk assessment from the player?

Return-to-play decisions

After a player gets hurt, the team physician must make a return-to-play decision both during the game (on the field) and during the period of injury management (i.e., days after injury) (Lovell et al. 2004). When the injury is a concussion, the return-to-play decision involves the evaluation of severity (measured by duration of loss of consciousness, amnesia, and confusion), other symptoms (lingering headache, fatigue, photosensitivity, etc.), and performance on neurocognitive testing, in addition to the athlete's prior history of concussion (Lovell et al. 2004). Return-to-play guidelines following concussion exist to minimize the risk of long-lasting effects (Yard and Comstock 2009). These guidelines establish that any player who had loss of consciousness in the field should not return to play in the same day (Pellman et al. 2005). A retrospective study performed by the National Football League using data from 1996–2001 compared NFL players who experienced concussion and returned to the field on the same day with those who were removed from play. The study concluded that the guidelines might be too conservative for professional players (Pellman et al. 2005). NFL team physicians use clinical judgments rather than guidelines when making return-to-play decisions (Pellman et al. 2005). The burden of responsibility on the team physician is great in such cases due to the possibility of catastrophic outcomes following a bad decision.

Health care professionals identify return-to-play decisions as one of the main ethical conflicts in sports medicine (Anderson and Gerrard 2005). In most cases, the athlete's goal is to play as soon as possible (Johnson 2004). The coach and manager also need the player to be back on the field. The team physician might be the primary person whose main concern is to evaluate and decide on the basis of both the short- and long-term health of the athlete (Johnson 2004). Ideally, the decision should not be dominated by the desire to affect the outcome of the competition or by the coaches, but should be based instead on the risks and consequences to the health of the athlete (Burgess 2012). Return-to-play decisions are unique to sports medicine and can be challenging because, while the primary aim of the team physician is the well-being of the athlete, he or she also must support the team goals (Johnson 2004). Sports medicine physicians' responses to the survey administered in Anderson's study identified the sources of pressure to return to the game as coming from the players, coaches, and other team members (Anderson and Gerrard 2005).When asked about the ethical issues in sports medicine, half of the team physicians surveyed identified the conflict between athletes' health and the pressure to return them to play (Anderson and Gerrard 2005). Awareness of this conflict is the first step to solving the problem, but more studies and regulations are needed to address it effectively.

Advertising

Medical advertising was once considered illegal and unprofessional in the United States and is still illegal in countries such as Italy and Germany (Capozzi and Rhodes 2000). Today, advertising is considered essential to the promotion of merchandise in the United States, and it is founded on the idea that democratic societies have freedom of expression and trade (Capozzi and Rhodes 2000). If medical advertising in the United States is legal and culturally accepted, then what is the ethical concern in the case of sports medicine? The main concern is that some clubs are accepting bids from physicians or medical groups to serve as a team physicians in exchange for the public relations opportunities that the position might entail (Johnson 2004). The hospital, medical group, or health care corporation pays the club in exchange for the "privilege" of being the team physician (Tucker 2004). From Attarian (2001):

> "The example of a professional (or collegiate) team putting the role of 'team physician' up for bids is not new. The collision of major market forces over the past four to five years has made this behavior the rule rather than the exception."

The ethical concern of the business situation in this case is that the team physician will not be chosen for his competence but for his high bid (Tucker 2004). The athlete, the coach, and other team participants can lose confidence in the team physician, leading to negative consequences for athletes' health and safety (Tucker 2004). One suggestion for solving this important ethical conflict is full disclosure. The team physician should fully disclose any financial relationship with a given club in all advertisements and promotions (Attarian 2001).

Research in progress and the lack of evidence-based medicine

Team physicians have to deal with many unanswered questions that hinder decision-making. Repetitive brain trauma seems to cause a neurodegenerative disease known as "chronic traumatic encephalopathy" (Baugh et al. 2012). A study in NFL retired players showed that 1.9% NFL retirees are diagnosed with dementia between the ages of 30 and 49 years, compared with 0.1% in the U.S. population (Weir et al. 2009). Other sports involving repetitive concussion are also associated with chronic traumatic encephalopathy, such as professional hockey and professional wrestling (Baugh et al. 2012). The hypothesis that repetitive brain trauma leads to early dementia is not yet proved, however. How should physicians proceed during the informed consent process considering the high degree of uncertainty in sports medicine? Should they be more conservative and err on the side of player protection, or should they just base their decisions on strong evidence? Are the tendencies of the physicians to be conservative or permissive affected by whether the club pays their salary?

The rapid technological evolution of sports medicine paired with its huge financial implications and the small sample of professional athletes available for research collectively contribute to a lack of evidence-based medicine in this field (Dunn et al. 2007). Team physicians must rely on their own knowledge when choosing new interventions and use clinical evidence whenever possible to make therapeutic decisions. Most importantly, the lack of evidence-based medicine must be communicated to the athlete (Dunn et al. 2007).

Use of medical innovations is associated with three important consequences: lack of information about the innovation itself or limits of knowledge, conflict of interest when the provider of a new drug or device has more than the player's health in mind, and concerns about the safety and effectiveness of the new product (King and Robeson 2008). Dealing with these consequences can lead to ethical conflicts. Studies, even small ones, help us test safety and effectiveness of drugs and devices. Conflicts of interest should be disclosed. Conferences, seminars, and discussion forums can help to keep physicians up to date; guidelines can help to standardize treatment and improve safety. But the fundamental issue of lack of evidence will continue to affect patient and physician decision-making. A physician should operate according to his or her best assessment of the current data, taking into account the relative risks and benefits of different strategies and considerations about where evidence is lacking, and should not let short-term needs allow for decisions that make the risks unnecessarily high.

Drugs and performance enhancement: risks and regulations

What is the role of the team physician regarding performance-enhancing substances and devices? What is the obligation of the team physicians when they receive information on athletes' use of an illegal substance? Regarding legal performance-enhancing substances, is

the athlete the only person responsible for assuming the risk of use, or should the team physician actively work to help the athlete with that decision?

The use of performance-enhancing drugs has been controlled and regulated by the World Anti-Doping Agency (WADA) since 1999. The WADA Code is a set of rules that regulate the use of performance-enhancing substances. In simple terms, the rules are violated when: 1) there is detection of a prohibited substance in an athlete's sample; 2) there is known use or attempted use of a prohibited substance; 3) the athlete refuses to submit a requested sample; or 4) there is evidence of tampering or attempted tampering of doping control measures (WADA 2009). Prohibited drugs include anabolic agents, peptide hormones and growth factors, beta-2 agonists, some hormones, metabolic modulators, and diuretics. Blood doping and other techniques for enhancement of oxygen transfer are prohibited methods, as is gene doping (WADA 2009). According to FIMS, the use of prohibited drugs is unethical and strictly forbidden, and the sports medicine physician should oppose their use (FIMS position statement). The NFL League Policies for Players contains a list of prohibited substances similar to that included in the WADA Code. The NFL policies also establish that all players will be tested for prohibited substances at least once per year or more often at random (NFL 2012).

Performance-enhancing substances have been used not only by professionals but also by young athletes at the high school and college level and by non-competing amateurs (Sjöqvist 2008). Given the regulations against the use of performance-enhancing drugs and their numerous health risks, it seems clear that team physicians should strongly discourage their use. In the eyes of some ethicists, a physician who assists an athlete in doping is being unethical, often outside the law, and is therefore jeopardizing his career (Finnoff et al. 2010). While this may be the most widely accepted opinion, it is not a consensus position. Some believe the physician should discourage the use of legal or illegal performance-enhancing substances but should not end the medical relationship if an athlete insists on using drugs, particularly if they are technically legal. There is no question that the physician should follow the health of the athlete and continue to warn him about the risks and legal consequences of substance use (Dunn et al. 2007). Others go further and argue that androgenic steroids in particular should not be banned but rather considered a part of a comprehensive training program in sports (Finnoff et al. 2010).

Ketorolac (Toradol) is another example of a controversial drug widely used in professional football. Ketorolac is a moderately potent analgesic and anti-inflammatory drug that serves to attenuate the aches and pains of a high-contact sport with bruises and joint and muscle aches. The risks of ketorolac are not fully understood, but it clearly has renal toxicity and may potentiate the risk of concussions (Belson and Pilon 2012). In addition, players pre-treated with ketorolac may not be fully aware of the physical effects of their activities and thus may risk more damage than they would otherwise incur.

Local anesthetic injection is considered a method of performance enhancement by some authors. Its use is controversial and poses an important ethical dilemma in sports medicine, despite not being considered a performance-enhancing substance by the World Anti-Doping Agency. Although use of such injections is widespread, little is known about their associated complications (Orchard 2002). A case-series of 100 players who had received anesthetic injections on 1023 occasions concluded that most of the procedures were safe, but some have been associated with substantially worsened performance (Orchard et al. 2010). If there is evidence that the procedure can worsen the injury, should the athlete decide whether future consequences are more important than absence from a game? The complexities of short-term gains for a football player who chooses to stay on the field by limiting pain and enabling maximum performance are enormous. The athlete must be well-informed of short-

and long-term risks (Orchard 2001), but should he have the final say in the matter? The athlete's autonomy is again a central issue in this discussion.

Genetic testing

Advances in genetic testing have raised new ethical concerns. Although these advances have potential for increasing the health and well-being of patients, they also have potential to cause harm depending on how they are used (Williams 2009). New findings in genetic testing have raised the possibilities of enhanced sports performance and sports potential prediction (Savulescu and Foddy 2005).

In professional sports, the use of genetic tests to predict better performance in athletes might be considered to violate justice principles, particularly because the tests' ability to result in discrimination is probably greater than their ability to prognosticate performance. The Council of Europe Bioethics Convention and the Genetic Information Non-Discrimination Act of 2008 already address discrimination issues related to genetic tests (McNamee et al. 2009). The Genetic Information Non-Discrimination Act prohibits employment decisions based on genetic information (Nemeth and Bonnette 2009). Athletes' selection using a genetic test may be considered an act of discrimination with consequent legal implications. However, genetic tests can also be done for safety purposes (McNamee et al. 2009). The consensus from the Study Group of Sports Cardiology of the Working Group of Cardiac Rehabilitation and Exercise Physiology and the Working Group of Myocardial and Pericardial Diseases of the European Society of Cardiology recommends genetic screening before sports participation in patients suspected to have Marfan's syndrome and to detect patients with long QT syndrome (Pelliccia et al. 2005). Genetic screening is indicated for athletes who have a family member diagnosed with hypertrophic cardiomyopathy or certain arrhythmias (Trusty et al. 2004).

With a positive genetic screening in hand, what is the role of the team physician? If the physician does not allow the athlete to play, it can be considered discrimination and the Genetic Information Non-discrimination Act, as described earlier. The team physician may decide to allow the player to participate after informed consent. Again, the decision-making process, in the context of professional sports, is affected by many external influences. If the screening is positive and the athlete ignores its results to continue playing, should the physician disclose the information to the coach and team management? Confidentiality and trust between patient and doctor would probably be broken if the information was disclosed.

Another example of a genetic test that could significantly affect NFL players is the identification of apolipoprotein E4. Adults who are positive for E4, even as a single allele, are more likely to have poor long-term central nervous system outcomes after traumatic brain injury (Zhou et al. 2008). While this finding is controversial, it triggers a discussion: What if a gene was found that predicted a higher likelihood of serious risk of brain injury with trauma? Should that person be allowed to play football? What right does a player have to accept a higher risk of injury than average, relative to the responsibility of the team management and team physician? The solution will not be absolute—it will be one that incorporates degrees of risk and responsibility. It will require review and acceptance or rejection of the data underlying the premise (that there is risk) and agreement on a plan of management. As it happens, if a brain injury risk gene is identified, it may also be applied to retired players (affecting their insurance) and current players (affecting how their careers are managed after head trauma). Serious thought should be given to the ethical implications of this area of knowledge because it will affect a far larger portion of the population than just players in the NFL.

Discussion/future directions

There is a pressing need for more studies investigating the issues surrounding ethics in sports medicine. Not only do we need a more complete picture, we also require studies with larger sample sizes and increased statistical power to address both the ethical and medical issues covered in this review. Ethics and the law are often closely related (Johnson 2004).

However, in sports medicine, ethics are also closely linked to the safety of the athletes. Decision-making processes in this field can mean the difference between a young player with a long life expectancy and a satisfying career and a former player with a permanent injury or premature dementia. We need to better understand what is involved in the decision-making process for both team physicians and athletes. Health care educational programs to help the athletes better understand the long-term consequences of their decisions also need to be created and tested for efficacy. A long-term follow-up is needed to evaluate clinical consequences of decisions made and to generate improvement in sports medicine. Through long-term follow-up, we will also be able to better study satisfaction in decision-making and other aspects related to ethical dilemmas in sports medicine.

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