CONCUSSIONS AND SAN MATEO COUNTY HIGH SCHOOL SPORTS: MORE TO LEARN, MORE TO DO

ISSUE

What more can the County's school districts do to reduce the serious consequences of concussions that occur during high school sports?

SUMMARY

The risk from concussions incurred during organized sports is well established. Long-term physical and psychological ill-effects, including chronic traumatic encephalopathy (CTE), personality changes, depression, poor cognition, and even suicide may result. Concussions continue to occur in high school sports, including those in San Mateo County high schools. The 2014-2015 San Mateo County Civil Grand Jury reported on the issue of concussions in high school sports. Prompted by continuing research showing the risks of concussions and an interest in whether the recommendations of the previous Grand Jury report were followed, this Grand Jury has undertaken a re-examination of the issue.

Despite the recommendations of the 2014-2015 Grand Jury, this year's Grand Jury found that much remains unchanged in local high schools. For example, staffing high risk sporting events with athletic trainers is incomplete, and school districts' promises to report concussion data to a central County database remain unfulfilled. Examples from other high school programs locally and across the country demonstrate that progress can be made. For example, Michigan High School Athletic Association (MHSAA) has a statewide database of concussion information that has shown useful trends and lessons. The ConcussionSmartMarin.org program has established a common county-wide protocol that includes collection of concussion data. Although a primary goal for all high schools in San Mateo County should be to minimize the risks of concussions by careful execution of a well-considered "concussion protocol" and to make basic information about concussions public, progress towards those goals among the various San Mateo County high school districts has been uneven.

The 2018-2019 San Mateo Grand Jury recommends establishing a common San Mateo County concussion protocol across all the County high school districts.[1] The San Mateo County Office of Education (SMCOE) should assert leadership in this effort. The common concussion protocol needs to: (1) clarify both the specific responsibilities of those involved in the protocol and when the steps of the protocol need to be accomplished, (2) make neurocognitive testing an optional part of the protocol, (3) establish a county-wide database of concussions that can track the frequency and circumstances of concussions and track compliance with the protocol.

[1] As used herein, the term "high school districts" refers not only to "union high school districts" which serve only students in grades 9-12, but also "unified school districts," which serve students in grades 9-12 but also younger students.

Furthermore, the Grand Jury recommends that an annual summary of the database be published so that parents, students, and educators can be better informed on this important issue. Finally, the Grand Jury reiterates the 2015 recommendation that the school districts should provide certified athletic trainers at high risk sporting events, including all football games.

GLOSSARY

California Interscholastic Federation **(CIF)** - An organization in the state to which five of the six San Mateo County High School Districts belong. CIF establishes rules and minimum standards governing interscholastic athletics (grades 9-12).

Centers for Disease Control and Prevention **(CDC)** - A US government agency that conducts and supports health promotion, prevention and preparedness activities in the United States, with the goal of improving overall public health.

Certified Athletic Trainer **(CAT)** - An athletic trainer certified by the National Athletic Trainers' Association. Certification requires completing certain levels of education, passing a test, and maintaining continuing education.

Chronic traumatic encephalopathy **(CTE)** - A neurodegenerative disease that is found in people who have suffered from chronic traumatic brain injury (TBI). A specific pattern of tau protein found at autopsy in the brain is required for the diagnosis.

ConcussionSmartMarin.org **(CSM)** - A collaboration among multiple organizations to help Marin County schools establish and carry out a concussion protocol and to help gather county-wide data on concussions.

ImPACT (Immediate Post-Concussion Assessment and Cognitive Testing) - A collection of neurocognitive assessments administered online in a controlled environment. It is owned by ImPACT Applications, Inc. It is a type of neurocognitive testing.

Licensed Health Care Provider, Licensed Health Care Professional - **(LHCP).** Licensed health care providers are trained in the evaluation and treatment of concussions/brain injuries and authorized to allow the athlete to return to play. The "scope of practice" for licensed health care providers and medical professionals is defined by California state statutes. This scope of practice limits the evaluation to a medical doctor (MD) or doctor of osteopathy (DO).[2]

Michigan High School Athletic Association **(MHSAA)** - A private, voluntary association for public, private, and parochial secondary schools in Michigan.

mild Traumatic Brain Injury **(mTBI**) - There is no universally accepted definition of mTBI. mTBI can be considered synonymous with concussion. One definition states: "any period of

[2] California Interscholastic Federation website, "Constitution", 2018-19. http://www.cifstate.org/governance/constitution/Article_1.pdf

observed or self-reported: transient confusion, disorientation, or impaired consciousness; dysfunction of memory around the time of injury; loss of consciousness lasting less than 30 minutes" as well as "observed signs of neurological or neuropsychological dysfunction."[3]

Neurocognitive testing **(NCT)** - also called neuropsychological testing - A comprehensive evaluation of a person's cognitive status by specific neurologic domains, including, but not necessarily limited to, memory, attention, problem solving, language, visuospatial, processing speed, motor, and emotion and may be administered by either pen and paper or by computer. NCT generally requires a neuropsychologist for interpretation but can be administered by others.

Peninsula Athletic League **(PAL)** - The Peninsula Athletic League is a 17 member league of schools from Atherton to Daly City.[4]

SCAT- The SCAT 5 (or 3) is a standardized tool for evaluation of injured athletes for concussion and can be used in athletes aged 13 years and older.[5] It is a type of neurocognitive testing.
Standard of Care - A practice of medical care that is defined by a professional organization, such as the CDC or the American Academy of Pediatrics.

Traumatic Brain Injury **(TBI).** There is no universally accepted definition of TBI. One version from the CDC states a disruption in the normal function of the brain that can be caused by a bump, blow, or jolt to the head, or penetrating head injury.

BACKGROUND

An autopsy exam of the brain of Pittsburgh Steeler star Mike Webster by Dr. Bennett Omalu helped establish the diagnosis of chronic traumatic encephalopathy (CTE) following football head injuries.[6] A player's love for football can compound the tragedy of CTE, and sometimes disaster can occur at a young age, such as death at 25.[7] Other sports where concussions occur can have similar outcomes. For example, Kelly Catlin, a Stanford student and Olympic cyclist, died by suicide at age 23, preceded by personality changes following a concussion.[8] CTE remains a

[3] C. Prince & M. Bruhns, "Evaluation and Treatment of Mild Traumatic Brain Injury: The Role of Neuropsychology", Brain Sci, 7, 2017, 105-119. https://www.mdpi.com/2076-3425/7/8/105/pdf
[4] Peninsula Athletic League website, http://www.smcoe.org/parents-and-students/peninsula-athletic-league/
[5] BJSM Online First, "SCAT5 Sport Concussion Assessment Tool-5th Edition", April 26, 2017, https://bjsm.bmj.com/content/bjsports/early/2017/04/26/bjsports-2017-097506SCAT5.full.pdf
[6] B. I. Omalu, S. DeKosky, R. Minster, & al., "Chronic traumatic encephalopathy in a National Football League player", Neurosurgery, July 1, 2005, 128-134.
[7] T. Leonard, "Moms take on football, suing Pop Warner for their sons' head trauma, deaths", San Diego Union Tribune, January 28, 2018. https://www.sandiegouniontribune.com/sports/sd-sp-moms-sue-pop-warner-for-cte-damage-20180128-story.html
[8] C. Boren, "Cyclist Kelly Catlin's family donates her brain for concussion research", Washington Post, March 13, 2019. https://www.washingtonpost.com/sports/2019/03/12/cyclist-kelly-catlins-family-donates-her-brain-concussion-research/?utm_term=.b668faf3024d

diagnosis that cannot be made before death,[9] nor does any current test predict those who will develop CTE from head injuries.[10]

The number of concussions in adolescents in the United States is enormous. Estimates are that from 300,000[11] to as many as 3.8 million concussions[12] occur in the USA each year during competitive sports. The acute recovery from mild traumatic brain injury (mTBI) is fairly rapid in most adolescents, though in girls more slowly than in boys, Figure 1.[13]

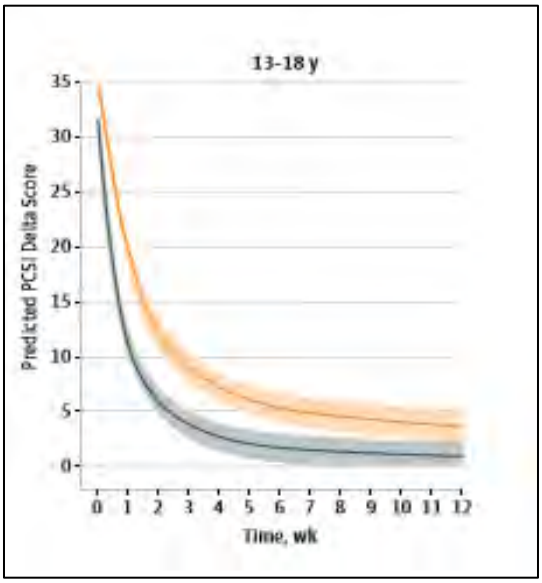

Figure 1: Recovery from mTBI using the delta score, defined as the difference between the current rating and the preinjury rating of the Post-concussion Symptom Inventory (PCSI). Upper curve is girls, lower is boys.[14]

While most athletes recover from mTBI, a small fraction, poorly determined at present, suffers longer term chronic symptoms, especially after repeated injury. The range of post-mTBI psychological changes include PTSD (post-traumatic stress disorder), depression, decreased cognitive performance, personality changes, drug abuse, and suicide.[15,16] Prospective long-term

[9] A. Ropper, "Links in the Chain of Chronic Traumatic Encephalopathy", NEJM 380, May 2, 2019, 1771-1772.
[10] R. Stern, C. Adler, K. Chen & al., "Tau Positron-Emission Tomography in Former National Football League Players", NEJM, 380, May 2, 2019, 1716-1725.
[11] L. Gessel, S. Fields & C. Collins, "Concussions Among United States High School and Collegiate Athletes", J of Athletic Training, 42(4), December 2007.495-503.
[12] K. Harmon, J. Clugston, K. Dec & al., "American Medical Society for Sports Medicine position statement on concussion in sport", Br. J Sports Med, 53, 2019, 213-225.
[13] A. Ledoux, K. Tang K. Yeates & al., "Natural Progression of Symptom Change and Recovery From Concussion in a Pediatric Population", JAMA Pediatrics, 173(1), January 7, 2019, 1-11.
[14] Ibid.
[15] E. Kim, E. Lauterbach, A. Reeve & al., "Neuropsychiatric Complications of Traumatic Brain Injury", J. Neuropsychiatry Clin. Neurosciences, 19(2), 2007, 106-127.
[16] T. Madsen, A. Erlangsen, S. Orlovska, & al., "Association Between Traumatic Brain Injury and Risk of Suicide", JAMA, 320(6), 2018, 580-588.

studies on the effects of mTBI are in progress, which may clarify the fraction of those suffering longer term effects of mTBI.[17] While serious long-term effects may follow an mTBI,[18] the direct cause of these effects remains difficult to prove, especially for individual cases.[19] Another area of great medical need, optimal treatment for mTBI,[20] is beyond the scope of this report.

Since the risks of athletics-related concussions have become clear, California has regulated concussion management in high school sports with specific emphasis on football, (AB 2127 [2014]).[21] The statute sets forth the required training of coaches, the timing for return to play after an injury, limitations on practice time, as well as other aspects of managing high school sports with respect to concussion risk. In response, schools and high school districts adopted "concussion protocols" that set out how these requirements are to be fulfilled. These protocols define the school districts' policies and are critically important in understanding how student athletes may fare with respect to concussions.

Certified athletic trainers (CATs) and their roles in concussion protocols

The American Medical Association has long endorsed the presence of certified athletic trainers (CATs) at high school sports.[22] The American Academy of Family Practice[23] has a similar recommendation.[24] The range of services that a CAT can provide is broad: (1) developing and implementing emergency action plans and pre-season conditioning programs, (2) advising on safety of equipment, weather, and field conditions, (3) providing first response to and triage of acute injuries, (4) implementing treatment and rehabilitation for injured athletes, and (5) determining readiness for return-to-play after injury.[25] The CAT is often the first healthcare professional to respond to an injury and can focus on the injured student, unlike the coach who must supervise others in the game. The CAT often can carry out key steps of the concussion protocol, such as communicating with parents, physicians, and teachers, and supervising return to play. One study found there were more injuries and more recurrent injuries in schools without athletic trainers than those with athletic trainers.[26]

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[17] M. McCrea & G. Manley, "State of the Science on Pediatric Mild Traumatic Brain Injury: Progress Toward Clinical Translation", JAMA Pediatrics, 172(11), November 2018.
[18] Ibid.
[19] L. Goldstein & R. Diaz-Arrastia, "Traumatic Brain Injury and Risk of Suicide", JAMA, 320(6), August 14, 2018, 554-555.
[20] Ibid.
[21] State of California, "AB 2127, Cooley. Interscholastic sports: full-contact football practices: concussions and head injuries", 2014. https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201320140AB2127
[22] American Medical Association, "Policy Policy H-470.995", 1998 https://www.nata.org/sites/default/files/ama_recommendation.pdf
[23] The American Academy of Family Practice provides board certification of family practitioners in the US, thereby maintaining the quality of that medical subspecialty.
[24] Athletic Trainers for High School Athletes website. https://www.aafp.org/about/policies/all/sports-medicine-trainers.html
[25] L. Pierpoint, C. LaBelle, C. Collins & al., "Injuries in girls' soccer and basketball: a comparison of high schools with and without athletic trainers", Injury Epidemiology, 5, 2018, 29-37.
[26] Ibid.

California is unique among the 50 states and the District of Columbia in that it has no mechanism to certify the qualifications of athletic trainers.[27] Legislation is now being considered to remedy that (AB 3110 [2020]).[28] Nevertheless, colleges in California train athletic trainers, and there are national and state associations (National Athletic Trainer's Association, the California Athletic Association) that certify athletic trainers based on their education, training, and expertise as demonstrated by passing a test, and continuing education.[29,30]

Neurocognitive tests (NCT) in the diagnosis and care of concussions

NCT at baseline and following head injury was recommended by the 2014-2015 Grand Jury report on concussions (R1).[31] However, several reasons justify changing this recommendation. While it may appear to be common sense to evaluate head injury with a neurological test and to compare that test with a baseline test before injury, doing that in practice is not straightforward and requires training and expertise not routinely available to high school sports programs.[32] While the administration of ImPACT can be done on any laptop or desktop computer, "ImPACT is intended to be used by medical professionals qualified to interpret the results of a concussion assessment examination and aid in the management of concussion."[33] A recent technical study on ImPACT testing made clear that the interpretation of the NCT requires a specialist's evaluation.[34] The NCT, SCAT5, has been used as a sideline evaluation tool of concussions (including Cabrillo Unified as will be discussed below), but when it is used, who interprets the results, if a baseline comparison has been done, how the comparison is made, and how that information is integrated into the clinical observations can all affect the usefulness of the test.[35,36] For example, the use of SCAT5 by non-medical staff is against the published directions of the test.[37] Requiring NCT at baseline and after injury goes beyond the recommendations of the

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[27] Chris Mullin, "Former Warrior Chris Mullin calls for licensing athletic trainers", The Mercury News, March 22, 2019. https://www.mercurynews.com/2019/03/22/former-warrior-chris-mullin-calls-for-licensing-athletic-trainers/

[28] State of California, "AB 3110, as amended, Mullin. Athletic Trainers", 2018. https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180AB3110

[29] National Athletic Trainer's Association (NATA) website. https://www.nata.org/

[30] California Athletic Trainers' Association (CATA) website. https://ca-at.org/

[31] San Mateo County Civil Grand Jury, 2014-15, "Athletes at Risk: Are San Mateo County High Schools Safeguarding Athletes from Serious Head Trauma?", 2015. https://www.sanmateocourt.org/documents/grand_jury/2014/head_injury.pdf

[32] P. Schatz, JE Pardini, MR Lovell, & al., "Sensitivity and Specificity of the ImPact Test Battery for concussion in athletes", Arch Clin Neuropsychol, 2006, 91-99.

[33] ImPACT Applications, Inc, "ImPACT Administration and Interpretation Manual", 2016. https://pulse-static-files.s3.amazonaws.com/ecb/document/2017/02/07/a05aa3da-93d7-4fff-b9cb-2fb3a89c960f/IMPACT-interpretation-manual.pdf

[34] "These recommendations, combined with the complex nature of the clinical diagnosis of concussion, highlight the necessity of concussion programs to include members who have advanced knowledge of psychometric testing and performance validity assessment in addition to knowledge of management of concussion." C.A. Abeare, I.Messa,B. Zuccato, & al., "Prevalence of Invalid Performance on Baseline Testing for Sport-Related Concussion by Age and Validity Indicator", JAMA Neurology, 2018, 697-703.

[35] Ibid.

[36] Supra, Note 32.

[37] Supra, Note 5.

Centers for Disease Control (CDC)[38] and the American Medical Society for Sports Medicine.[39] "Baseline testing may be useful in some cases, but is not necessary, required, or an accepted standard of care for the appropriate management of SRC (Sport Related Concussion)."[40] Although the CDC position is, "Healthcare professionals may use validated, age-appropriate computerized cognitive testing in the acute period of injury as a component of the diagnosis of mTBI,"[41] there is no recommendation to use it as a standard of care.[42] A medical expert, who leads an area clinic specializing in sports-related concussion, expressed her medical judgment that NCT at baseline and after head injury is not required nor essential; however, NCT at baseline and post injury can be a useful piece of data in evaluation and treatment of a patient with a sports-related concussion.[43]

Data collection for concussions in organized school sports.

Many questions about the risks of concussions in athletics remain incompletely answered. Which sports are the most dangerous? How much more dangerous are multiple concussions? Do laws limiting contact during football practice lead to fewer concussions? Are the risks of concussions decreasing or increasing? Only by collecting data on the frequency of concussions in each sport, the circumstances of the injury, and the relationships between risk factors and outcomes will the public be informed about the risk of high school sports. This information may also suggest ways to decrease those risks and indicate whether changes in protocols and rules may be helping. Getting answers will help each parent and student answer the key question: Are the benefits of playing a sport greater than the risks?

The NFL has reluctantly adopted plans to collect data.[44] Some college leagues are proactively collecting data and now can show that a simple rule change -- shortening the field during kickoffs -- has reduced concussions.[45] Starting in the 2015-2016 school year, the Michigan High School Athletic Association (MHSAA) required all high schools report head injuries to the MHSAA through an online reporting system.[46] The MHSAA data collection asks for information about the student (i.e., grade, gender, level, and sport), the injury event, the medical examiner,

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[38] A. Lumba-Brown, K. Yeates, K. Sarmiento, & al., "Centers for Disease Control and Prevention Guideline on the Diagnosis and Management of Mild Traumatic Brain Injury Among Children", JAMA Pediatrics, September 4, 2018, E1-E13.
[39] Supra, Note 12.
[40] Ibid.
[41] Supra, Note 38.
[42] Ibid.
[43] Grand Jury interview with local medical expert.
[44] New York Times, "Decoding the N.F.L. Database to Find 100 Missing Concussions", March 24, 2016. https://www.nytimes.com/2016/03/25/sports/football/at-least-100-concussions-left-out-of-nfl-studies.html
[45] D. Wiebe, B. D'Alonzo, R. Harris, & al., "Association Between the Experimental Kickoff Rule and Concussion Rates in Ivy League Football", JAMA, 320(19), November 20, 2018, 2035-2036.
[46] Michigan High School Athletic Association, "MHSAA Report Shows Reduction in Concussions During 2017-18 School Year", August 8, 2018. https://www.mhsaa.com/News/Press-Releases/articleType/ArticleView/articleId/7441/MHSAA-Report-Shows-Reduction-in-Concussions-During-2017-18-School-Year

the date the student is authorized to return to play, and any missed school.[47] Furthermore, summaries of the data have been published. One of the lessons learned is that girls are at higher risk for concussions for sports, such as soccer and basketball, that have the same rules for boys and girls.[48] All of these processes to collect data have safeguards to protect the privacy of the individuals involved.

How do sports vary as to risk of head injury?

Data for the risk of head injury for different high school sports comes from the Michigan data.[49,50] Tables 1 and 2 show a summary of two years of data for the sports with the highest number of head injuries. Boys football has by far the highest risk (by rate - more than 40 injuries per thousand participants - and numerically, data not shown but can be derived). For girls, soccer is the sport with the highest potential for a head injury (28 or 25 injuries per thousand participants). For boys, ice hockey (not available in San Mateo County) and wrestling also have rates of head injury greater than 20 per thousand participants. For girls, basketball, cheer (cheerleading), and lacrosse have similar rates (around 20 per thousand participants).

Table 1: Girls sports concussion by prevalence from Michigan in order of frequency

Order	Sport	2016-2017		2017-2018	
		Participants	Head Injury Reports per thousand	Participants	Head Injury Reports per thousand
1	Soccer	13,212	28	13,216	25
2	Basketball	15,896	23	15,654	20
3	Cheer	6,720	22	6,715	20
4	Lacrosse	2,814	20	2,900	20
5	Gymnastics	636	13	702	16
6	Volleyball	19,067	9	19,416	9
7	Softball	13,641	11	13,610	7

Table 2: Boys sports concussion by prevalence from Michigan in order of frequency

Order	Sport	2016-2017		2017-2018	
		Participants	Head Injury	Participants	Head Injury

[47] Michigan High School Athletic Association, "Summary Report: Michigan High School Athletic Association head injury reporting system 2015-2017 School Year", 2017, https://www.mhsaa.com/portals/0/Documents/health%20safety/concussionreport1516.pdf

[48] A. Bretzin, T. Covassin, M. Fox, & al., "Sex Differences in the Clinical Incidence of Concussions, Missed School Days, and Time Loss in High School Student-Athletes", American J of Sports Med, 2018, 2263-2269.

[49] Michigan High School Athletic Association, "Summary Report: Michigan High School Athletic Association head injury reporting system 2017-2018 School Year", 2018. https://www.mhsaa.com/portals/0/Documents/health%20safety/concussionreport1718.pdf

[50] Michigan High School Athletic Association, "Summary Report: Michigan High School Athletic Association head injury reporting system 2016-2017 School Year", 2017. https://www.mhsaa.com/portals/0/Documents/health%20safety/concussionreport1617.pdf

			Reports per thousand		Reports per thousand
1	Football	36,571	45	35,583	41
2	Ice hockey	3,411	36	3,365	32
3	Wrestling	9,598	26	9,397	25
4	Lacrosse	5,114	18	5,168	17
5	Soccer	14,630	14	14,619	12
6	Basketball	21,267	8	21,372	9
7	Baseball	17,998	4	17,675	3

A regional model for a common concussion protocol is found in Marin County: ConcussionSmartMarin.org.[51]

In Marin County, ConcussionSmartMarin.org (CSM), a coalition of school districts, local medical experts, health systems, and other interested parties has worked together since 2017 to decrease the risks following concussions in the county high schools and to "coordinate county-wide protocols for educating, reporting and treating concussions among Marin's student athletes."[52] CSM has helped respond to the recommendations of a Marin County Civil Grand Jury Report on concussions in high schools in 2016[53] and a follow-up report in 2018.[54] The Marin County Office of Education (MCOE) was key in establishing the collaboration, and the county office's Director of Education Services has been a leader of the program.[55] CSM functions as a collaboration, and the MCOE does not dictate policy. The collaboration has written a protocol which is detailed, practical, and can be updated or revised as necessary.[56,57] This protocol was being applied across the district in 2018.[58] The CSM website includes the protocol and documents supporting the protocol (Appendix B) that could be used as a model for San Mateo County.[59] The protocol has a detailed flow map of the steps that need to be followed, separating steps done by school personnel, by parents, and by Licensed Health Care Providers. There is also a detailed list of documents that are used at different steps of the process.

[51] ConcussionSmartMarin.org website. https://www.concussionsmartmarin.org/
[52] The organizations include Kaiser Permanente, Marin Athletic Foundation, Marin County Office of Education, Marin County School Nurses, Marin County Health and Human Services, Marin General Hospital, Novato Community Hospital, Schurig Center for Brain Injury Recovery and Certified Athletic Trainers in the schools
[53] Marin County Civil Grand Jury 2015-16, "Head injuries and concussions: Are our high schools keeping our children safe?", 2016. https://www.marincounty.org/-/media/files/departments/gj/reports-responses/2015/head-injuries-and-concussions.pdf?la=en
[54] Marin County Civil Grand Jury 2017-18, "Head injuries and concussions: Are our high schools keeping our children safe? A Follow-Up", 2018. https://www.marincounty.org/-/media/files/departments/gj/reports-responses/2017-18/head-injuries-and-concussions-a-followup.pdf?la=en
[55] M. Volain, "Marin schools focus on concussions as football participation declines", Marin Independent Journal, August 29, 2018. https://www.marinij.com/2018/08/25/marin-schools-focus-on-concussions-as-football-participation-declines/
[56] Ibid.
[57] Interview with CSM leaders.
[58] Ibid.
[59] Supra, Note 51.

ConcussionSmartMarin.org has also helped all of their high schools collect data on concussions.[60] The MCOE performs the centralized data collection. The data they collect for each event is shown in Appendix B. A preliminary analysis of their data has been posted on their website,[61] and more complete analyses are in progress.[62]

DISCUSSION

The 2014-2015 Grand Jury report on concussions and responses from San Mateo School Districts.

The 2014-2015 Civil Grand Jury of San Mateo County issued a report titled: "Athletes at Risk: Are San Mateo County High Schools Safeguarding Athletes From Serious Head Trauma?"[63] There were three recommendations: school districts should (1) provide athletic trainers, (2) conduct neurocognitive testing pre- and post-head injury, and (3) maintain data on concussions at the district level and report such data in an anonymized format to the Peninsula Athletic League (PAL). The school districts, to whom the report was directed, responded to each finding and recommendation. The six San Mateo County (SMC) districts with high schools[64] were in general agreement with the report's finding that athletic trainers provide a valuable service in protecting student athletes. Despite this agreement, only two districts, San Mateo Union and Sequoia Union, agreed to provide part-time athletic trainers for some sporting events. Four responded that they would decide after four months of evaluation. With respect to neurocognitive testing (NCT), there was general disagreement with the finding that the cost of NCT was "minimal." For the recommendation that NCT be done at baseline and after head injury, two districts, San Mateo Union and Sequoia Union, said they already conduct pre- and post-injury NCT, and the other four said they would decide after six months of evaluation. (Details of these six month evaluations are not known but the outcomes of those evaluations are described below in the current status of these recommendations at the six high school districts.) With respect to the recommendation that data on concussions be collected at the district level, all districts reported they maintain data and are willing to submit it to the Peninsula Athletic League (PAL). Of note, in the last three years, PAL has not been consulted by a school district on centralizing concussion data nor has it been provided with any concussion data.[65]

What are the San Mateo County High School Districts doing about concussions now, and is there a role for the San Mateo County Office of Education (SMCOE)?

[60] Interview with CSM leaders.
[61] ConcussionSmartMarin.org, "Marin County High School Athlete Concussion Data," https://www.concussionsmartmarin.org/student-concussion-data
[62] Interview with CSM leaders.
[63] Supra, Note 31.
[64] San Mateo County has 3 high school districts (Jefferson Union High School District, San Mateo Union High School District, Sequoia Union High School District) and 3 Unified school districts that include high schools (Cabrillo Unified School District, La Honda-Pescadero Unified School District, South San Francisco Unified School District).
[65] Interview PAL official.

Currently, the individual districts formulate and implement concussion policies. The SMCOE is not involved with these policies.[66]

However, on a strategic level, the SMCOE describes its role to enhance the capabilities of school districts in a broad range of areas: Quoting the Strategic Plan 2016-2021 of the SMCOE, "…few [of the school districts in San Mateo County] have the bandwidth or regional perspective of the County Office of Education. Individually, schools and districts lack the platform to frame the agenda for widespread change. SMCOE works to understand district challenges and priorities in order to provide operational services and program support to all 23 school districts in the county. It is the hub of educational *information and data* **[**emphasis added]… The SMCOE advocates for effective policies, provides seminal thought leadership, offers district access to the best information possible, enhances district-wide practices, and supports operational efficiencies…."[67] Through its "Safe and Supportive Schools" initiative, SMCOE has expanded its leadership into areas broader than traditionally classroom activities. These efforts include establishing common immediate response safety protocols, "The Big Five,"[68] across the County.

Grand Jury Survey to San Mateo County High School Districts

The Grand Jury sent a survey to the six high school districts in San Mateo County to learn about their current policies regarding concussions. The questionnaire is found in Appendix A. The following discussion is based on written responses.[69]

A. General sources of policies

Five of the high school districts – Cabrillo Unified, Jefferson Union, San Mateo Union, Sequoia Union, South San Francisco Unified -- are members of California Interscholastic Federation (CIF). As members of CIF, they use CIF as the starting point for their policies, but may have additional policies in their concussion protocols.[70] La Honda-Pescadero Unified is not a CIF member, and while it uses the CIF forms, it also uses its own basic concussion-related forms.[71] In summary, the school districts use a range of forms and information that come from a range of different sources.

B. **Are there notable omissions in the districts' concussion policies?**

[66] Interview with SMCOE leader and responses to survey.
[67] San Mateo County Office of Education, "Excellence and Equity in Education", 2015. http://www.smcoe.org/assets/files/about-smcoe/strategic-plan/SMCOE%20Strategic%20Plan.pdf
[68] San Mateo County Office of Education, "The Big Five - School Emergency Guidelines", 2019. http://www.smcoe.org/learning-and-leadership/safe-and-supportive-schools/the-big-five.html
[69] Responses to Grand Jury survey.
[70] Supra, Note 2.
[71] Pescadero High/Middle School, "Athletic Packet", August 15, 2018. https://www.lhpusd.com/site/handlers/filedownload.ashx?moduleinstanceid=2163&dataid=2319&FileName=Athletic%20Packet.pdf

Based on the Grand Jury survey, the 2018-2019 Grand Jury found examples of important deficiencies in the districts' concussion policies.[72] The following are examples of information not explicitly stated in some (1-4 below) or all (5) of the districts' concussion protocols, along with the Grand Jury's view of the importance of that information:

1. Who makes the initial observation of possible concussion (trainer, coach, or others including parents)? If a parent is aware of a head injury that occurs either in school or outside of school, it is important that the school be made aware so that the appropriate Return-to-Play/ Return-to-Learn (RTP/RTL) protocols can be put into place.

2. What is the process for notifying parents of a possible concussion, including what forms are used, who contacts the parents, and when does this notification need to occur? This is an important step with important details that needs to occur within a window after the injury to make sure appropriate follow-up is done, including an evaluation by a LHCP.

3. If neurocognitive testing (NCT) is part of the concussion protocol, when tests are to be done, who interprets the test results, and how the test results impact on subsequent events need to be described and should be consistent with the instructions specified by the test provider. Without those parameters being defined, the utility of the tests cannot be justified.

4. Is there a formal process to track compliance with the concussion protocol? This would entail documenting for each student who has had a suspected concussion whether each important step of the concussion protocol is followed and by whom. For example, is there a mechanism to track if the Return-to-Play protocol followed the timing as required by law? It is not enough to have rules; it is also important that records are kept to document whether those rules are followed.

5. While there may be records kept for whether the student has had previous concussions, is there a policy to restrict athletic participation for multiple concussions? Given the higher risks of long term problems following multiple concussions,[73] this is important to specify.[74]

C. Which are high-risk sports and are there any special considerations for high-risk sports?

[72] Note that in Appendix B, the flow diagram from ConcussionSmartMarin.org outlines the steps in 1-2 below.
[73] "Although studies of the effects of multiple concussions on cognitive function and symptom presentation have had mixed results, more studies report unfavorable changes than do not….Athletes with a history of concussion may have more severe subsequent concussions and may take longer to recover." F.P. Rivara, M.A. Ford, & al., "5 Consequences of Repetitive Head Impacts and Multiple Concussions" in *Sports-Related Concussions in Youth: Improving the Science, Changing the Culture*, ed. National Research Council (The National Acadamies Press, 2014), 203-238.
[74] A CAT interviewed by GJ stated that a student suffering two concussions in one year should not continue to play.

For five of the six high school districts surveyed, there is no designation of high-risk. The one exception, Cabrillo Unified, designates football, soccer, wrestling, and basketball as high-risk. For those high risk sports, a CAT is present at games and at football practice in that school district.

D. Is neurocognitive testing (NCT) required at baseline or after head injury, and if so, which one is used?

San Mateo Union requires ImPACT testing as a baseline and after head injury. Sequoia Union does not require that athletes have a baseline ImPACT testing; however, ImPACT testing is given to football, water polo and volleyball teams, and if a baseline test has been done, additional testing is done after head injury. Within this district some high schools, e.g., Menlo-Atherton High School, make baseline ImPACT testing a requirement.[75] Cabrillo Unified does not require baseline or post-injury NCT but the NCT, SCAT5, is strongly encouraged. The other districts do not use NCT at baseline or after injury.

E. Data reporting for San Mateo County high schools

Despite the recommendation in the 2014-2015 Grand Jury report that the school districts maintain data on concussions and despite all of the school districts' stated willingness to collect and report the data to the PAL, this is not being done.[76] Jefferson Union does not collect any data. San Mateo Union has each high school collect data independently. South San Francisco Unified has each coach collect data. Sequoia Union has each of its high schools track concussion data independently and there is no centralized data. There are plans for Sequoia Union to work with Lucile Salter Packard Children's Hospital to collect district-wide concussion data.[77] Cabrillo Unified has an online database that tracks injuries. La Honda-Pescadero Unified reported no concussions in the last three years.[78] No district reports their data to a centralized site, with the exception of La Honda-Pescadero Unified, where all injuries are reported on Incident Reports to the district.

F. Athletic trainers in San Mateo County high schools

Of the six high school districts, three do not provide any certified athletic trainers (CATs): Jefferson Union, South San Francisco Unified, La Honda-Pescadero Unified. While Pescadero High School is very small (92 students) with a limited athletic program, both Jefferson Union and South San Francisco Unified have multiple large high schools with large athletic programs that include football. As a result, higher risk events such as football games may not be covered by CATs unless one is provided by the opposing team from outside the district. One response to the Grand Jury survey pointed out that while CATs are not present at football games, Emergency Medical Technicians (EMTs) are present. However, EMTs and CATs have very different

[75] Interview with Menlo-Atherton High School official.
[76] Responses from survey.
[77] Communication with Sequoia Union.
[78] Responses from survey.

training and responsibilities and EMTs have no role in the execution of concussion protocols. Three other districts have CATs at each of their high schools with athletic programs - Cabrillo Unified, San Mateo Union, and Sequoia Union.

CONCLUSION

This Grand Jury has re-evaluated the findings from the 2014-2015 Grand Jury report. As mentioned above, current science states that NCT can be helpful in the diagnosis of concussions, but the current standards of care do not recommend the routine use of these tests at baseline or after head injury, and complexities in the execution and interpretation of these tests make their use difficult.[79] In addition, the concerns of the school districts about costs of these tests make clear that part of the reason for not doing the tests is cost.[80] Therefore the Grand Jury no longer recommends the use of NCT as a standard part of a concussion protocol.[81]

The Grand Jury determined that current practices to protect against concussion risks in San Mateo County high schools remain highly variable from school to school and district to district. Moreover, the protocols are inadequate as can be seen in comparison to ConcussionSmartMarin's more complete and well-defined protocol (Appendix B). To bring all of the high schools up to a consistent high standard, the Grand Jury recommends that a common San Mateo County concussion protocol be adopted by all of the County high school districts.

This San Mateo County concussion protocol needs to specify a process of concussion data collection for all high school sports. The data collected should also include district-wide information such as the number of participants in each sport, as well as information about each head injury event. For example, the ConcussionSmartMarin data elements are shown in Appendix B. All of these processes to collect data need safeguards to protect the privacy of the individuals involved. Because the number of events from individual schools and individual districts is generally small, these data need to be collected centrally as recommended by the previous Grand Jury report. A summary report needs to be made public annually to inform and educate the public.

Reviewing the standards of care for athletic trainers, the Grand Jury still agrees strongly that certified athletic trainers (CATs) are useful to help decrease the risks following mTBI. Nevertheless, the Grand Jury recognizes that cost may be a factor.[82] From discussions with PAL and CATs, various strategies could be used to mitigate the expense of a CAT, such as using visiting team CATs or seeking part-time CATs supported by local health organizations.[83]

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[79] Supra, Note 34.
[80] Supra, Note 31.
[81] A concussion specialist interviewed by the Grand Jury and the current Marin County concussion protocol agreed with this conclusion.
[82] An estimate from Salary.com (https://www.salary.com/) is that a certified AT earns approximately $50,000/year. Generally, CATs cover all the athletic events at a high school and cannot be present at all events, thus requiring judgment to decide which events to cover as described in interviews.
[83] Grand Jury interviews.

FINDINGS

F1. Concussions in high school athletics have potential serious negative health consequences, both short-term and long-term.

F2. Concussion protocols describe what must happen following a suspected concussion and can ensure students complete the required legal and medical steps following an injury.

F3. Each San Mateo County (SMC) high school district and unified school district is responsible for its own concussion protocol, and these vary from district to district and even school to school.

F4. Responses to the 2018-2019 Grand Jury survey show that existing concussion protocols are inadequate because of omissions and lack of clarity on what to do after a suspected concussion.

F5. None of the SMC current school district concussion protocols provided to the Grand Jury in response to its survey have a mechanism to track compliance.

F6. The San Mateo County Office of Education (SMCOE) currently has no role in writing or implementing concussion protocols.

F7 The SMCOE has expressed in their Strategic Plan,[84] and in their "Safe and Supportive Schools" programs, the vision that the SMCOE could encompass a leadership position in areas broader than traditional classroom activities. One area where the SMCOE could assume a leadership position is in raising the level of concussion care in the County high schools.

F8. ConcussionSmartMarin (CSM) provides a regional example of a concussion protocol that includes detailed steps to be followed when a possible concussion injury is observed and provides a process for collecting county-wide concussion data.

F9. Neurocognitive testing (NCT) may contribute to the diagnosis of mild traumatic brain injury, but multiple complexities compromise its use in practice, either at baseline or after head injury. If NCT is used as part of a concussion protocol, clear guidelines should be written to describe how tests are interpreted and who should interpret them, which does not appear to be the case in the districts that use them.

F10. The availability of county-wide data on concussions summarized across sports and across high school districts can lead to more informed individual decisions by students and

[84] Supra, Note 67.

parents on concussion risks and allow for tracking of whether changes in sporting rules or concussion assessment practices decrease concussion risks over time.

F11. There is no county-wide database across all districts of SMC that tracks the frequency and circumstances of concussion data in high school sports.

F12. Certified athletic trainers (CATs) are trained in all aspects of carrying out concussion protocols. Their availability or presence on the field at the time of a concussion event is a valuable resource to decrease the consequences of concussions.

F13. Three SMC high school districts do not provide athletic trainers: Jefferson Union, South San Francisco Unified, and La Honda-Pescadero Unified. Jefferson Union and South San Francisco Unified have active football programs.

F14. No standard definition of high-risk sports exists throughout the United States; the definition remains a judgment call by parents, educators, and physicians. Tables 1 and 2 show that for Michigan high schools, football clearly stands out as having more head injuries.

RECOMMENDATIONS

R1. By September 2020, the San Mateo County Office of Education (SMCOE), with input from each high school district and unified school district, should establish a common "San Mateo County Concussion Protocol" that will:

a. Identify the specific responsibilities of those involved who carry out the steps of the concussion protocol as well as the timing of those actions.
b. Establish a county-wide database of concussions by sport - to include number of students by gender participating in each sport, frequency of head injuries, circumstances of head injuries (e.g., whether incurred at a formal game or at practice), timing, and completion of RTL/RTP steps.
c. Make neurocognitive testing (NCT) an option, not a requirement. If a school or district does use NCT at baseline or after injury, it should be made clear which test is used, who administers the test, how the results are reported, and who interprets the results.
d. Specify that at a minimum, football games and full-contact practices should be attended by certified athletic trainers (CATs).
e. Establish a process for tracking compliance with the San Mateo County Concussion Protocol.

R2. Beginning with the 2020-2021 school year, each high school district and unified school district should supply its statistics for the database to the SMCOE annually.

R3. By September 2021, the SMCOE should publish an annual summary of the database on its website (excluding personally identifiable information), so that parents, students, and

educators can be better informed on concussion risks for high school students' sports of choice.

REQUEST FOR RESPONSES

Pursuant to Penal Code Section 933.05, the Grand Jury requests responses as follows:

From the following individuals:

- San Mateo County Superintendent of Schools - R1, R3

From the governing bodies of:

- San Mateo County High School Districts
  - Jefferson Union High School District - R1, R2
  - San Mateo Union High School District - R1, R2
  - Sequoia Union High School District - R1, R2
- San Mateo County Unified School Districts
  - Cabrillo Unified School District - R1, R2
  - La Honda-Pescadero Unified School District - R1, R2
  - South San Francisco Unified School District - R1, R2

The governing bodies indicated above should be aware that the comment or response of the governing body must be conducted subject to the notice, agenda, and open meeting requirements of the Brown Act.

METHODOLOGY

Documents

- Reviewed 2014-2015 Grand Jury Report on concussions and responses from County high school districts.
- Reviewed published guidelines, medical literature, and news reports pertaining to concussions.
- Reviewed documents listed in bibliography.

Interviews

- Sent questionnaire to and received written responses from the six high school districts on current concussion protocols and practices.
- Conducted interviews with representative of the SMCOE, concussion medical expert, athletic directors, representative of Peninsula Athletic League, representatives from ConcussionSmartMarin.org, and San Mateo County athletic trainers.

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APPENDIX A

Questionnaire sent to the superintendents of the six high school districts

Please respond to the following questions and please provide the documents mentioned:

1. Which sports are offered to students at schools within the district?
    a. Are sports head injury/concussion policies within the district the same across all sports? [Note: This assumes there are district-wide policies.] If not, do district sports head injury/concussion policies treat some sports as higher risk with respect to such head injuries/concussions than others? If so, which sports are treated as higher risk?
2. Does the district establish and implement the policies relating to sports head injuries/concussions, or are such policies established and implemented by individual schools within the district? If the district is responsible for such policies, rather than individual schools, who is the individual within the district responsible for establishing, updating and implementing such policies?
3. Does the district require neurocognitive testing for athletes as a condition of their participation in any sports sponsored by schools within the district? If so, how often is the athlete required to have such testing done?
4. Does the district require any neurocognitive testing to be performed on athletes participating in school sponsored sports within the district following their suffering any head injury/concussion while participating in such sports?
5. Within the district, which district employees (e.g., coaches, assistant coaches, trainers) are required by the district to be "licensed health care providers" within the meaning of AB2127?
6. Please provide any data maintained by the district relating to possible head injuries/concussions incurred by athletes participating in school sponsored sports within the district during the last [three] years.
7. Please provide a copy (or links) to the district policies relating to
    a. Information related to head injuries/concussions provided to parent and students prior to student participation
    b. Parental and student consent requirements and forms in connection with participation in school sponsored sports
    c. Process of documenting possible head injury/concussions.
    d. Process of documenting treatment, physician follow-up, and outcome following a head injury
    e. Form given to student after a possible concussion
    f. Return to play/learn

A follow-up Question was sent, tailored to their responses from the previous grand jury report about Athletic Trainers:

1. At what athletic events are ATs present or available (for example on campus but in office or another event): sports, levels (JV, varsity), game (home away), practice, always, when possible
2. Are ATs required to be certified? If so by whom. If not, does the district use another requirement similar to ATA certification?
3. Does each high school have an AT? More than 1?

APPENDIX B

Concussion Protocol Guide for Marin County Schools

Background

California Education Code Section 49475 (and California Laws AB-2007 and AB-2127) *requires all schools that offer athletic programs to:*

- *Recognize signs of concussion, immediately remove the athlete from the activity for the remainder of the day, and not permit the athlete to return to play until he or she receives written clearance to return by a licensed healthcare provider*
- *Each athlete shall complete a graduated return-to-play protocol of no less than seven days in duration, under the supervision of a licensed healthcare provider.*

Application of California Education Code 49475

- *The graduated return-to-play protocol applies to all concussions that occur at school (athletics, physical education, other activity) and concussions that occur outside of school.*

Forms: Document and Respond to Head Injury Occurring at School

Marin County Schools' protocol for students with possible concussions includes standard reporting and tracking forms. The supervising adult starts the process, with the school nurse or other designated school representative as the main informational point of contact. A student who has begun the concussion protocol must not participate in any athletics or physical activity until they have received written clearance from their licensed healthcare provider.

ConcussionSmart Marin Forms

Form	Description	Recipient
Head Injury Report	Immediately documents and describes incident – who received injury, as well as when and how injury happened. English and Spanish language versions.	• Witness/supervising adult to complete. • Parent/guardian receive and sign. • Copy kept by school.
Head Injury Referral	Sent to licensed healthcare provider for diagnosis of possible concussion. Licensed healthcare provider to sign and provide/attach initial plan for Return to Learn and possible Return to Play plan for student.	• School nurse or designee to complete - copy provided to parent/guardian to sign. • Licensed healthcare provider to fill out and sign.
School Accommodations Following Concussion	Checklist of modifications for schoolwork and activities prescribed by licensed healthcare provider.	• Parent/guardian to sign. • Licensed healthcare provider to complete/sign. • Designated school representative receives a copy.
Concussion RTP Clearance	Licensed healthcare provider confirmation that student can begin activity and before student can resume competitive play.	• Licensed healthcare provider must sign and return copy to designated school representative.
Concussion RTL Protocol	Information regarding possible concussion symptoms and recommended instructions for progressive recovery at school.	• For parent/guardian, student
Return to Learn: Daily School Checklist of Concussion-Related Symptoms	Five-day calendar and checklist of symptoms encountered and accommodations utilized for a student following concussion.	• Completed by designated school representative(s)
Concussion RTP Protocol	Details recommended stages for progressive return to competitive athletics.	• For parent/guardian, student
Return to Play Progress	Checklist for documenting student's progress as they return to play.	• Completed by designated school representative(s)

Links to Forms

Head Injury Report

Head Injury Referral

School Accommodations

Return to Play Clearance

CIF Return to Learn Protocol

Daily School Checklist

CIF Return to Play Protocol

Return to Play Progress

Forms Flow Chart

California Education Code Section 49475 (and California Laws AB-2007 and AB-2127) requires all schools that offer athletic programs to:

- Recognize signs of concussion, immediately remove the athlete from the activity for the remainder of the day, and not permit the athlete to return to play until he or she receives written clearance to return by a licensed healthcare provider
- Each athlete shall complete a graduated return-to-play protocol of no less than seven days in duration, under the supervision of a licensed healthcare provider.
- Application of California Education Code 49475
- The graduated return-to-play protocol applies to all concussions that occur at school (athletics, physical education, other activity) and concussions that occur outside of school.
- Incident documented. All forms filled out, delivered to and signed by respective parties.
- Parent/guardian collects student. (Student should not drive.) Forms provided to parent/guardian.
- Student examined and diagnosed by licensed healthcare provider.

Return to Learn Protocol

Step 1: School nurse or designee established as liaison between student's licensed healthcare provider(s) and school staff

- If injury occurred outside of school, parents and student's licensed healthcare provider are responsible for notifying school.
- If injury occurred in school, school staff are responsible for notifying school
- nurse or designee (coach, athletic trainer, PE and other teachers, administrators, etc.)
- School nurse or designee initiates Return to Learn and Return to Play for student (and parent release to exchange information).

Step 2: School nurse or designee obtains an incident report; oversees exchange of information

- For any out-of-school injury, the nurse or designee obtains a history from the parent and medical providers.
- School nurse or designee identifies licensed healthcare provider managing student's post-concussion care (e.g., primary care doctor, rehabilitation physician, neurologist.)

School responsibility when no licensed healthcare provider is managing student's care:

- If student does not see a licensed healthcare provider, the school will abide by the California State Law Return to Learn and Return to Play protocols.

School responsibility when student's licensed healthcare provider refutes a concussion, despite symptoms witnessed by school staff:

- If school staff witness symptoms of concussion at school, but these observations are not validated by the child's licensed healthcare provider, schools will abide by the minimum standard management for suspected concussion.
- Designated school staff will provide written follow up with parents/guardian.

Step 3: School nurse or designee as liaison to school personnel

- School nurse or designee notifies staff (teaching, PE, athletic, others) about concussion and to observe/report potential symptoms; school nurse distributes information received from managing licensed healthcare representative.
- If student experiences persistent symptoms in class or between classes, consider convening a meeting of a "Student Study Team" to include the following people: school nurse or designee, administrator, student's teachers, counselor psychologist; invite parent and athletics staff; consider (based on symptoms): speech therapist, site special education representative.
- Establish point communication persons for: Student at school, school-to-parent, school-to-healthcare representative.
- School nurse or designee should provide regular reminders to teachers to modify workload as per Return to Learn plan, using information from: teacher's own observations, student self-report, physician and parent guidance.
- Extracurricular activities (drama, clubs, etc.) to be treated same as curricular activities.
- If symptoms anticipated to be less than four weeks: use ISHP (Individualized Student Health Plan) format; Consider "contract" homework with modified expectations.
- If symptoms anticipated to be more than four weeks, consider convening a 504 Team.
- If student cannot attend school at all, consider homebound education.

Step 4: School communication with managing physician/clinician and parent

- Staff to document the following, to be communicated by school liaison:

1. Symptoms noted in school and what exacerbates these symptoms (may use Return to Learn: Daily School Checklist.
2. Difficulty noted in any select subjects.
3. Student adherence to school and physician recommendations.
4. Attendance record, time arriving in school, time leaving school.
5. Number of breaks student requires and their nature and duration.

- School staff may review the Symptom Wheel, to help note elements of a student's behavior that may be relevant to document.

Step 5: Revisit and revise Return to Learn plan, as necessary

- Reconvene Student Study Team meeting, as necessary.
- Change individualized health plan or 504, as necessary to reflect improving or worsening condition.
- If symptoms persist for months, consider a special education referral (based on traumatic brain injury.)

Return to Play Protocol

1. Send Return to Play Progress form to student's licensed healthcare provider and begin gradual return to activity based on licensed healthcare provider's instructions.
   - Schools may accept the Return to Play Prescription or other form signed by student's licensed healthcare provider, as clearance as long as they do not permit return to play earlier than the district's own Return to Play Clearance form.
2. "Return to Play" Protocol
   - Progression is adapted from the *International Concussion Consensus Guidelines* and *CIF Concussion Return to Play Protocol.* Summary is described in Stages 1-4, below.
   - A student's medical provider may recommend more restrictions, but not fewer restrictions.
   - If student's medical provider recommends fewer restrictions than Stages 1-4 below, refer this to the school nurse or designee who can communicate with the medical provider.
   - Each student must be kept from any exertive activity beyond 15 minutes of walking (Step 1) for the first and second day after the concussion.
   - Student may not resume any physical activity beyond 15 minutes of walking until the student tolerates normal academics. *Exception*: If back-to-normal academics have not been achieved by two weeks post-concussion, a physical activity program can be prescribed by the student's managing physician in conjunction with school health, physical education and athletic staff.

Progression for Physical Activity Cannot Exceed Following Steps:

Stage 1. Limited activity for 5-10 minutes that is designed to increase the student's heart rate (e.g., exercise bike, walking, light jogging); No weight lifting, jumping or hard running. As student will be resting at home at least 24 hours after experiencing symptoms of concussion, do not start Stage 1 until at least 48 hours after head injury with symptoms of concussion.

Stage 2A. Light aerobic activity. Student can attempt 10-15 minutes of brisk walking or stationary biking under direct supervision by designated school representative.

Stage 2B. Moderate activity, with limited body and head movement. May go 20-30 minutes, but be reduced from typical routine for age. (e.g., moderate jogging, brief running, moderate intensity stationary biking, and moderate intensity weightlifting)

Stage 2C. Strenuous aerobic activity including running or stationary biking for 30-45 minutes or weight lifting up to 50% of max weight.

Stage 2D Heavy, non-contact activity (closer to what would be in student's typical routine), but non-contact. (e.g., running, high-intensity stationary biking, regular weightlifting routine, non-contact sport-specific drills). At this stage, may add some cognitive component to practice.

Stage 3. Begin with limited contact practice. Controlled contact drills are allowed, but no scrimmaging. Then progress to full contact practice but no competition. **Prior to beginning this stage, make sure that student receives written licensed healthcare provider approval.**

Stage 4. Full contact and full activity can be resumed. Then, after written clearance from student's licensed healthcare provider, student may return to competition.

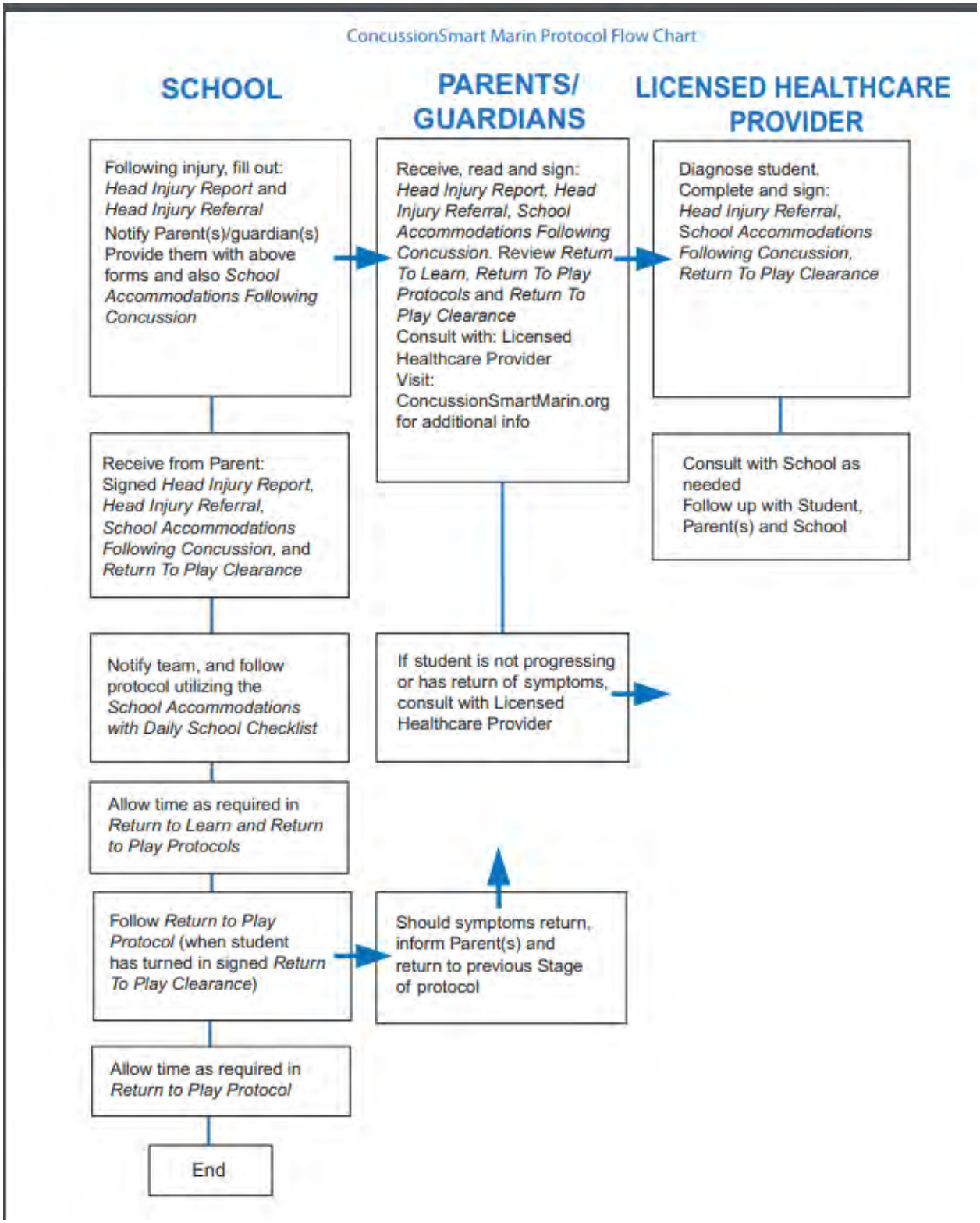
No student is permitted to move from one stage to the next, unless there has been an absence of symptoms or signs. Refer to CIF Return to Play Protocol for details.

a) School staff will document performance in each stage and report this to school nurse (and athletic trainer, if athlete). Nurse may communicate with student's licensed healthcare provider, as necessary; The District's Return to Play form may be used by any school staff member when a school nurse or athletic trainer is unavailable.

b) If symptoms or signs are experienced, then withhold activity until there are no symptoms for 24 hours, and then return to the previous step.

c) On weekends and days where there is no trained school staff member or physician to document successful progression from one step to the next, school may take parent and student history.

d) If a student fails to achieve any step on three occasions, refer the student to the managing physician with this information



Data collected from all the Marin County High Schools using simple Google form. This is a basic Google feature that allows you to create a survey to be shared with a desired audience:

- School
- Name of Recorder (Last name, First name)
- Role of Recorder at your school
- Grade Level (of student)
- Gender/Sex
- Date of Injury
- Sport Related (y/n)
- Identify Sport
- Sport Event (Practice, Game, Scrimmage)
- School Sponsored or Club level Sport
- Level of sport at time of injury
- Describe activity
- Site
- Date of full clearance (return to physical activity)
- Length/Duration of Return to Learn
- Length/Duration of Return to Play
- Is this the student's first concussion for the academic year?
- If no, how many previous concussions this academic year?
- Number of concussions across lifetime
- If outcome of student is not known, please provide a brief reason