Heart Protectors for ball players

Due to your involvement with youth baseball, I thought you would be interested in reading the text of an email I recently sent out to several key people involved with youth sports safety, including pediatricians and pediatric cardiologists. The section of the email where I first suggest guidelines for assessing the effectiveness of chest protectors for batters/fielders and then review the current products on the market (using the suggested guidelines) might be of particular interest to you.

I was surprised by the number of responses I received to my email, including many that suggested other key people involved with youth sports safety to whom I should forward the email. Following this email is the text of my response to one of the pediatricians who replied to my email. I think that you will find it interesting as it discusses AED's and chest protectors.

Initial Email:
Given your position on the Council of Sports Medicine and Fitness of the American Academy of Pediatrics, I thought you would be interested in the following, which pertains to a recent article in the national press titled "Chest Blows Fatal for Young Athletes" written by Jim Axelrod of CBS News. The article was written in the wake of the recent death of a sixteen-year-old New Jersey boy who died after being hit in the chest with a baseball while wearing a catcher's vest.

The sub-title of the article read, in part, "Doctors Want to Prevent Deaths Like Tommy Adams, Who Died of Commotio Cordis". Given that sub-title, I find it bewildering that the company that markets the Heart-Gard, the number-one-selling youth baseball chest protector (designed to be worn both while batting and in the field), doesn't provide the consumer with any impact testing data to back up their claims regarding its effectiveness. As such, a parent who purchases the product for their child or a league that requires its use by its players has absolutely no idea how effective the product actually is at doing what it purports to do - protect their child/player from commotio cordis and the serious, life-threatening injuries that can occur given blunt force impacts to the chest.

In the wake of the national media coverage usually accorded incidences of commotio cordis in youth baseball, due in large part to the free publicity the Heart-Gard has received in the coverage, hundreds of thousands of parents have purchased one hoping to protect their child from commotio cordis and the serious, life-threatening injuries that can occur given blunt force impacts to the chest, yet no one has questioned its effectiveness on the public stage. The question begs why the Doctors referred to in the aforementioned article's sub-title do not inform the public regarding the effective and ineffective products on the market and/or issue general guidelines to help consumers select an effective chest protector.

The fact that some children have died from commotio cordis and injuries caused by blunt force trauma to the chest even though they were wearing a chest protector underscores both the need to know how effective a product actually is and the fact that the time to test a product is before it is out on the market.

Apparently, the National Operating Committee on Standards for Athletic Equipment (NOCSAE) is working on developing a standard for youth baseball chest protectors. In the interim, however, tens of thousands more parents will be out there in the marketplace looking for a baseball chest protector that will protect their child from commotio cordis and life-threatening injuries – without any guidance whatsoever from the medical/youth baseball communities unless someone steps up to address the issue of the untested/ineffective products on the market.

Years of testing and research would not be required to identify the untested/ineffective products on the market; some simple, practical guidelines to selecting an effective chest protector would go a long way in helping parents select the best product for their child. Following are what could be general guidelines for selecting an effective baseball chest protector:

Heart Protectors for ball players

1) Relative to its size and shape, a chest protector – or part thereof - designed to protect the heart should cover the profile of the heart,

2) A chest protector – or part thereof – designed to protect the heart should be height adjustable so that the protection can be positioned over the profile of the heart, and

3) A chest protector – or part thereof - designed to protect the heart should be proven effective for the targeted age group in impact testing conducted by an unrelated entity generally recognized as an authority in the field.

If any youth chest protector failed to meet any of the above guidelines it would be considered an ineffective product.

If you check out this link to Little League Baseball's July 2008 ASAP (i.e. safety) newsletter (http://www.littleleague.org/learn/newsletters/ASAP_Newsletter.htm) you will see that there are essentially three youth baseball chest protectors (designed to be worn both while batting and in the field) on the market: the Heart-Gard, XO HeartShield and Pro Vest Baseball Chest Protector. Both Rawlings Sporting Goods and Adams USA previously offered similar products, but both companies have apparently discontinued the product.

Following below is a quick evaluation of the Heart-Gard, XO HeartShield and Pro Vest Baseball Chest Protector using the general guidelines for selecting an effective baseball chest protector I listed earlier in this email to assess their effectiveness. Please note that I am supplying this evaluation to open a dialogue on the subject of effective/ineffective products, I don't either expect or want anyone to accept my thoughts on the subject without checking out the facts for themselves.

Heart-Gard

1) Size/Shape

Both because of its shape (refer to Note A) and the fact that it only comes in one, relatively small size, the Heart-Gard is probably too small to cover the profile of the heart of most, if not all children.

(Note A: The shape of the Heart-Gard appears to leave the apex of the heart of any size child (of baseball playing age) unprotected.)

2) Height Adjustable

Because it is not height adjustable when incorporated into a compression shirt, the Heart-Gard will probably not be positioned over the heart of many of the children for whom the shirt itself fits.

3) Impact Tested

The Heart-Gard has not been impact tested. The obvious danger of an untested chest protector is that it may, in fact, only reduce the impact force of a 60 MPH pitch into the 40-50 MPH range in which, according to a major research study of commotio cordis, ventricular fibrillation is more likely to be induced.

In the aforementioned research study of commotio cordis the threshold velocity to cause ventricular fibrillation (i.e. the lower limit of vulnerability to commotio cordis) in the experimental model was 25-30 mph, while impacts at 20 MPH did not induce Ventricular Fibrillation.

In the experiment, the incidence rate of ventricular fibrillation increased incrementally from 7% for 25 MPH impacts to 27% for 30 MPH impacts and 68% for 40 MPH impacts, and then diminished incrementally to 53% for 50 MPH impacts and 37% for 60 MPH impacts (before increasing slightly to 38% for 70 MPH impacts).

Heart-Gard Summary

The Heart-Gard fails all three guidelines, and would thus have to be deemed an ineffective product for any age group.

XO HeartShield

1) Size/Shape

The XO HeartShield only comes in one, relatively small (6"H X 5"W) size. Because of its relatively small size, the XO HeartShield would probably only be appropriate for age groups ten and under.

2) Height Adjustable

Because it is not height adjustable, the XO HeartShield will probably not be positioned over the heart of many children for whom the shirt itself fits.

3) Impact Tested

In the aforementioned research study of commotio cordis, the incidence rate of ventricular fibrillation increased incrementally from 7% for 25 MPH impacts to 27% for 30 MPH impacts.

Because the XO HeartShield baseball chest protector has only been proven to reduce the impact force of a 60 MPH baseball by 50% in impact tests, it is probably only appropriate for those age groups where pitched/batted balls do not exceed 50 MPH. Given that, as I understand it, 45 MPH is not an uncommon pitch speed at the nine-year-old level - and the speed of a batted ball given a 45 MPH pitch can be greater 50 MPH - the XO HeartShield is probably only appropriate for use in the eight-year-old-and-under age groups.

XO HeartShield Summary

Because the XO HeartShield is not height-adjustable, it would have to be deemed an ineffective product for any age group.

Pro Vest Baseball Chest Protector

1) Size/Shape

The Pro Vest Baseball Chest Protector, which is essentially a chest plate incorporated into a foam vest, comes in five sizes (XS, S, M, L, XL), with each size having a different size chest plate.

2) Height Adjustable

The Pro Vest Baseball Chest Protector is height adjustable (via adjustable shoulder straps) within a 2" range so that the chest plate can be located over the profile of the heart.

3) Impact Tested

In impact testing conducted by one of the leading sports impact testing and research firms in the country – the same firm that handles all of the testing for NOCSAE - the Pro Vest Baseball Chest Protector attenuated the impact of a 77.38 MPH baseball by over 77%, to the equivalent of a 17.29 MPH baseball.

Pro Vest Baseball Chest Protector Summary

Given that the Pro Vest Baseball Chest Protector comes in five sizes, is height adjustable and, given its impressive performance in the 77.38 MPH impact test, would probably provide effective protection up to 90 MPH – reference the Impact Testing section of their website (www.pro-vest.com) for more information on this – the Pro Vest Baseball Chest Protector would probably be age appropriate for up to the 14 year-old age group, assuming the pitch speeds are 80 MPH or less.

Please feel free to follow up with any questions. It only takes one person of your stature to open this dialogue – which is long overdue. While the medical/youth baseball communities might not find any chest protectors they consider to be ideal, they will hopefully either identify those products that provide effective protection and/or issue general guidelines to help consumers select an effective chest protector. Thank you. Jim Gillen

The text of my response to one of the several pediatricians who replied to my email follows:

Thank you for your email. Yes, a readily available AED should be a requirement, however, even if the odds are that an AED will prevent commotio cordis (if retrieved quickly enough from the shed behind the field and correctly applied by an assistant coach), the reality is that parents who want to improve their child's odds of avoiding commotio cordis will continue to purchase chest protectors for their children.

To put it in stark terms, a lot of parents will opt to take a pro-active approach rather than rely on a safety plan that starts out with their child lying on the ground in the throes of ventricular fibrillation. This is especially so if the information in the following quote from another article written in the wake of the recent death of the sixteen-year-old New Jersey high school catcher who was hit in the chest by a baseball is correct: "Once commotio cordis occurs, the only treatment is the use of a defibrillator, which normally shocks the heart into resuming its normal rhythm. But defibrillators work in fewer than 20 percent of these cases, said Dr. David Landers, chairman of the heart and vascular hospital at Hackensack University Medical Center."

As I mentioned in my earlier email, it's also important to remember that there are other issues besides commotio cordis that motivate parents to purchase chest protectors for their children, such as the serious, life-threatening injuries that can occur given blunt force impacts to the chest.

Given the reality that parents will continue to purchase chest protectors (designed to be worn both while batting and in the field) for their children and leagues will continue to require their use – even with the ready availability of an AED – one would hope that the medical/youth baseball communities would acknowledge the need to provide some basic product guidelines for consumers, if not identify the effective chest protectors on the market. The over-four-year-old study of commercially available chest protectors to which you referred in your email even states the following: "Some of the chest protectors tested here seemed to blunt some of the previously reported facets of commotio cordis, such as ST

segment elevation, BBB, and LV systolic pressure. This may be evidence that the chestwall barriers that we tested do, in fact, mitigate in some respect the commotio cordis phenomenon".

That parents will continue to purchase chest protectors for their children is based on their logic that any product that deflects and/or absorbs any degree of a baseball impact is better than not wearing any protective gear. That is why it is imperative that the medical/youth baseball communities take the lead on the issue, because as the above quote (from the study) more than infers – and as my review of the products on the market in my earlier email pointed out – some products are clearly better than others.

Someone else to whom I had sent the email earlier (also) referred me to the aforementioned 2006 research study of commercially available chest protectors and pointed out that an earlier version of the Pro Vest Baseball Chest Protector I reviewed in my earlier email performed the best in the study of all the baseball chest protectors tested – and was one of only two chest protectors that decreased the occurrence of ventricular fibrillation when compared to controls. The Heart-Gard, which I also reviewed in my earlier email, was one of the worst performing chest protectors tested. The XO HeartShield was apparently not yet on the market in 2006.

The report that emanated from the 2006 research study states the following toward the end of the report: "It is our expectation that by using the present experimental data, improved chest barriers that ultimately will prevent this increasingly recognized cause of sudden cardiac death during sports activities can be designed and produced". Based on my review of the information on their website, it appears that at least one company whose product was tested in the 2006 research study, Pro Vest, took that message to heart and reengineered their Pro Vest Baseball Chest Protector.

While no mention of the 2006 research study is made on Pro Vest's website, what is mentioned is the following: "Please note that after a multi-year product development program, we launched two new vests in 2009 which replaced the model we had marketed earlier. Among the many significant improvements in our new vests are a molded plastic chest plate with raised ribs (versus the flat plastic chest plate in the old model) and new foam for the center chest pad. We engaged a highly regarded, nationally known impact testing & research firm to test several foams in combination with the molded plastic chest plate so as to select a foam for the center chest pad that would effectively attenuate the impact of a baseball and lacrosse ball.

The results of the baseball and lacrosse ball impact testing conducted on our new vests by the highly regarded, nationally known impact testing & research firm we contracted to perform the testing showed significant improvement over the impact testing results for our earlier vest. This is not to denigrate our old vest - if it was still on the market we believe that it would be the next-best product on market. The better impact testing results achieved by our new vests (versus our old vest) were the result of the molded plastic chest plate deflecting a greater degree of the impact and spreading out the remaining impact shock more effectively and the new foam used for the center chest pad absorbing more of the remaining impact shock."

Given the reality that parents will continue to purchase chest protectors (designed to be worn both while batting and in the field) for their children, the medical/youth baseball communities can opt to either take the lead in educating their patients/players on the effective products and/or issue guidelines for the selection thereof, or continue to not be a resource of information for their patients/players on the subject such that parents continue to purchase/children continue to use ineffective products.

Thank you. Jim Gillen

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