FROM EVIDENCE TO ACTION: A PROPOSED STRUCTURED CARDIOVASCULAR SURVEILLANCE PROTOCOL FOR COMPETITIVE BODYBUILDING

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Abstract: Sudden cardiac death (SCD) has emerged as one of the most serious—and most preventable—outcomes in competitive bodybuilding, with an estimated incidence of 32.83 per 100,000 athlete-years among active competitors and a risk more than five times higher in professionals than in amateurs. Speckle-tracking (strain) imaging studies show that athletes exposed to anabolic-androgenic steroids (AAS) have reduced myocardial deformation (a less negative global longitudinal strain, or GLS), often with a preserved ejection fraction—a pattern of subclinical dysfunction that conventional echocardiography misses. This article has two complementary aims: (1) to synthesize the scientific evidence supporting strain echocardiography as a cardiovascular surveillance tool in this population; and (2) to present an operational proposal—a Structured Cardiovascular Surveillance Protocol (SCSP)—that turns this evidence into a practical, replicable routine, bringing federations, coaches, athletes, and partner cardiology services together around an annual screening schedule, without any of these parties taking on the role of deciding for the athlete. The protocol is built on ongoing

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education, partnerships between events and health care providers to expand access to testing, and a color-coded (traffic-light) risk classification system that communicates results clearly while protecting medical confidentiality and athlete autonomy. We argue that pairing robust clinical evidence with a simple, ethical, and scalable institutional design offers a concrete path toward reducing fatal cardiac events in the sport.

Keywords: Echocardiography; Sudden Cardiac Death; Sports Medicine; Bodybuilding; Prevention.

INTRODUCTION

Competitive bodybuilding is living with a quiet paradox: while the number of athletes, events, and federations keeps growing year after year, so does the perception—until recently, poorly quantified—that the sport carries a disproportionate cardiovascular risk. That risk has a name and a mechanism that are fairly well described in the literature: pathological ventricular hypertrophy, structural cardiac remodeling, and subclinical myocardial dysfunction associated with chronic use of anabolic-androgenic steroids (AAS), compounded by extreme training loads, body-weight manipulation, and the metabolic stress surrounding competition (Baggish et al., 2017; Smoliga; Wilber; Robinson, 2023).

Data from an international cohort of the International Federation of BodyBuilding and Fitness (IFBB)—20,286 athletes followed over 190,211 athlete-years between 2005 and 2020—identified 121 deaths, 73 of them sudden and 46 classified as sudden cardiac death (SCD). Among athletes who were still competing at the time of death, SCD incidence was 32.83 per 100,000 athlete-years, with a risk more than five times higher in professionals than in amateurs (Vecchiato et al., 2025). Where autopsies were available, cardiomegaly and ventricular hypertrophy were consistent findings—an anatomical pattern that, in living athletes, can be anticipated by imaging methods sensitive to myocardial function before the ejection fraction changes.

Against this backdrop, speckle-tracking (strain) echocardiography stands out as the

most promising tool for active surveillance, because it detects subclinical myocardial dysfunction—expressed as reduced left ventricular global longitudinal strain (GLS)—even when ejection fraction remains normal (Castro et al., 2025; Hammoud et al., 2023a). The problem, however, is not only scientific; it is also institutional. The evidence is already there. What has historically been missing is a simple framework that puts it into practice systematically—without bogging down the athlete's career in red tape and without handing offto a third party (the federation, the coach, or the cardiologist/partner provider) a decision that is, ultimately, a personal one.

This article sets out to close that gap in two steps. First, it synthesizes the available evidence on strain echocardiography, AAS use, and sudden cardiac death in bodybuilding. Next, it presents a concrete operational proposal—a Structured Cardiovascular Surveillance Protocol (SCSP)—designed to turn that evidence into a field-ready routine through awareness campaigns run by federations and events, partnerships with health care providers that expand access to testing, and a color-coded risk communication system that protects both the athlete's autonomy and the cardiologist's clinical independence.

SCIENTIFIC BACKGROUND: STRAIN ECHOCARDIOGRAPHY AND SUDDEN CARDIAC DEATH IN BODYBUILDING

EPIDEMIOLOGY OF SUDDEN CARDIAC DEATH IN THE SPORT

Sudden cardiac death refers to an unexpected death of presumed cardiovascular cause, occurring shortly after symptom onset or unwitnessed in a previously asymptomatic individual (Al-Khatib et al., 2018). Across sports in general, classic incidence estimates in young populations range from 1 in 14,000 to 1 in 100,000 athlete-years, with the burden concentrated in higher-risk subgroups (Harmon et al., 2011). Structured preparticipation screening programs have already shown they can produce a sustained reduction in this mortality—the Italian experience documented a drop from 3.6 to 0.4 deaths per 100,000 athlete-years after a regional cardiovascular screening program was put in place (Corrado et al., 2006).

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In bodybuilding, the IFBB cohort cited in the introduction is the first large-scale risk quantification for the sport, and its findings support this article's central premise: the risk is not hypothetical—it is measurable, it is concentrated among professionals, and it has a consistent anatomical substrate (hypertrophy and cardiomegaly).

WHAT STRAIN REVEALS THAT CONVENTIONAL ECHOCARDIOGRAPHY DOES NOT

Global longitudinal strain measures myocardial deformation over the cardiac cycle and can pick up functional impairment before ejection fraction falls—which is why it is described as a marker of subclinical dysfunction. In healthy populations, the normal range for left ventricular GLS lies between -24% and -18%, with less negative values (closer to zero) indicating worse function (Farsalinos et al., 2015; Lang et al., 2015).

The table below summarizes the key findings of studies that used strain echocardiography to compare AAS users with non-users.

Study	Comparison	Main finding (LV GLS)
Hammoud et al. (2023a)	Off-cycle AAS users vs. non-users	-16.8% vs. -18.5% ($p = 0.001$), with preserved LVEF in both groups
Hammoud et al. (2023b)	Supraphysiological AAS use vs. athletes and sedentary controls	-15.4% in users, lower than both control groups ($p < 0.001$)
Angell et al. (2012)	AAS users vs. non-users	-14.6% vs. -16.9% ($p < 0.05$), with greater ventricular mass/wall thickness in users
Castro et al. (2025)	AAS users vs. non-users, real-world setting	-13% vs. -20% ($p < 0.01$); 100% of users had abnormal GLS by the study's cutoff
Vecchiato et al. (2025)	IFBB cohort, professionals vs. amateurs	SCD incidence of 32.83/100,000 athlete-years among active competitors;

		risk > 5 times higher in professionals

Taken together, these studies describe a consistent pattern: AAS users show systematically less negative GLS than non-users, with absolute differences of 1.7 to 7.0 percentage points, even when ejection fraction stays within normal limits. This impairment persists even outside periods of active use ("off-cycle"), suggesting a residual effect on myocardial deformation. Complementary studies in chronic users (Baggish et al., 2017) also describe biventricular dysfunction (Alizade et al., 2016; D'Andrea et al., 2022), greater exercise-induced lung congestion (D'Andrea et al., 2022), and regional alterations in myocardial work (Cazorla et al., 2023)—findings that, combined with the anatomical substrate observed in the mortality cohort's autopsies, paint a biologically coherent picture linking AAS exposure, structural remodeling, and electrical vulnerability under extreme load.

It is important to note that not every mechanical pattern seen in strength athletes is pathological: bodybuilders who do not use AAS tend to show reduced global circumferential strain (GCS), consistent with physiological adaptation to strength training, while GLS and ejection fraction remain normal (Szauder; Kovács; Pavlik, 2015). This distinction reinforces the role of strain not only as a risk marker but also as a tool for telling physiological athletic remodeling apart from AAS-related damage.

FROM EVIDENCE TO CLINICAL PRACTICE

Current sports cardiology guidelines already recommend incorporating strain into athlete evaluation, both to distinguish the "athlete's heart" from structural heart disease and to guide decisions on eligibility for sports participation (Pelliccia et al., 2021). The gap identified in this review, therefore, is not a lack of evidence or guidelines—it is the absence of an operational mechanism that brings the test, affordably and on a recurring basis, into the bodybuilder's routine, especially outside major urban centers and beyond the reach of health insurance or deep personal budgets.

FROM EVIDENCE TO ACTION: WHY AN OPERATIONAL PROTOCOL IS NEEDED

Experience in other sports shows that scientific evidence alone does not reduce mortality—it is the systematic implementation of screening protocols that does, as the Italian experience cited in Section 2.1 demonstrated (Corrado et al., 2006). In bodybuilding, three specific barriers stand in the way of implementation: (1) the lack of a single regulatory authority with the power to require testing, given how fragmented federations and events are; (2) the cost of strain echocardiography, which is out of reach for many amateur athletes; and (3) the tension between cardiovascular surveillance and athlete autonomy in a sport whose culture places a high value on individual decisions about one's own body and career.

The protocol described below was designed specifically to work within these constraints: it does not assume centralized regulatory power, it lowers the cost barrier through partnerships, and it resolves the tension between surveillance and autonomy by giving each party a strictly defined role—to educate, to advise, to evaluate, or to decide—with no overlap.

OPERATIONAL PROPOSAL: STRUCTURED CARDIOVASCULAR SURVEILLANCE PROTOCOL (SCSP)

The SCSP is a preventive protocol built around four parties—federation/event, coach, athlete, and cardiologist/partner provider—each with specific, mutually exclusive responsibilities. The fourth party brings together, as a single health care partner, the cardiologist (preferably a sports cardiologist, given the expertise required to acquire and interpret strain echocardiography) and the clinic or hospital where the test is performed; throughout this article, this party is referred to as the cardiologist/partner provider. The program's organizing principle is simple: information flows freely among the parties, but clinical data remain under the athlete's exclusive control.

STRUCTURE OF RESPONSIBILITIES

Party	Core Role	Concrete Actions
Federation / Event	Education and outreach	Campaigns on the website, social media, and at events; distribution of educational materials and QR codes; building a network of partner clinics offering discounted testing; recording proof that the test was completed, with no access to the clinical report.
Coach	Technical guidance	Builds the test recommendation into the season plan; asks the athlete to share their risk classification (color) before the macrocycle begins; documents that the athlete was advised; does not receive or store the medical report.
Athlete	Autonomy and personal responsibility	Receives the educational materials; schedules and completes the strain echocardiogram; receives the traffic-light report; shares the risk color with the coach; makes a free and informed decision about continuing prep; signs the Athlete Awareness Record (Section 4.5).
Cardiologist / Partner provider (clinic or hospital)	Independent clinical evaluation	Performs the test; assigns a risk color; counsels the athlete on findings and next steps; releases the report to the athlete only, preserving confidentiality and professional autonomy; is not responsible for the athlete's competitive decisions.

COMMUNICATION MATRIX AMONG THE PARTIES

Whether the program is ethically workable depends less on general rules of conduct and more on an explicit design of who talks to whom, about what, and in what format. For that reason, the protocol defines communication among the federation/event, coach, athlete,

and cardiologist/partner provider as a matrix of separate, asymmetric channels: each link receives only the information it needs to do its job—never the full clinical report—and no institutional message may read as a clearance or a disqualification. The table below details each channel.

From → To	What is shared	Format	Ethical/legal boundary
Federation/Event → Athlete and Coach	Campaign, educational materials, list of partner clinics, discount code	Website, social media, flyers, QR code	Mass, informational communication. Requires no individual confirmation and is not a condition for competition registration.
Athlete → Coach	The color only (Green / Blue / Yellow / Red)	Verbal or text message, at the athlete's initiative	Voluntary. The coach may ask whether the test was done but may not demand the report or turn the athlete away for not sharing it.
Cardiologist/provider → Athlete	Full report (GLS, LVEF, recommendations)	In-person visit + printed/digital report	The only channel carrying full clinical data. Standard medical confidentiality applies.
Cardiologist/provider → any other party	Nothing, unless the athlete gives express written authorization	—	Without the athlete's authorization, the cardiologist/partner provider does not communicate with the federation, event, or coach. This shields the cardiologist from pressure to clear or disqualify anyone.
Federation/Event → Partner provider	Discount code validation	Partnership's administrative	A purely commercial flow (redeeming the benefit), with

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(clinic/hospital)		system	no access to test results.
Federation/Event → Athlete (record)	Proof the test was completed (not the result)	Simple record of campaign participation	Documents the federation's preventive action without storing any health data.

Three safeguards hold this matrix together and keep any party from being held responsible for the athlete's decision:

* Standard disclaimer on all institutional communications. Posts, flyers, and coach records must explicitly carry language to the effect of "this information is provided for preventive and educational purposes only; the decision to compete rests solely with the athlete." This prevents any piece of communication from later being read as a medical or institutional clearance.

* Athlete consent as the only trigger for releasing data. No information beyond the color is released without the athlete's express written authorization—the same principle of specific, informed consent that data protection regulations apply to sensitive health data. Without that authorization, the cardiologist/partner provider does not communicate with the federation, event, or coach under any circumstances.

* Color triggers a recommendation, never a veto. Even for Yellow and Red classifications, the message the coach receives is that reassessment is recommended—never that the athlete is barred. The decision to move forward remains solely with the athlete.

In practice, this design meets the program's core requirement: raise awareness without coercion. The cardiologist is never put in the position of clearing or prohibiting an athlete; the federation and the event never become custodians of clinical data; the coach works only with a piece of operational information (the color), which is enough to adjust training load without becoming part of the medical decision; and the athlete remains, at every step, the sole holder of the report and of the final decision.

OPERATIONAL WORKFLOW

The program runs in five sequential steps:

* Federation/event campaign — outreach through the website, social media, printed flyers, and QR codes, with information on the cardiac risks associated with the sport, the benefits of annual screening, and the list of partner clinics offering discounted rates to member athletes.

* Coach guidance — at the initial season-planning meeting, the coach introduces the protocol and asks the athlete to get tested and share their risk classification before the start of the intensive prep phase.

* Athlete testing — scheduling at a partner clinic or a provider of the athlete's choice; strain echocardiography and, when indicated, myocardial work assessment.

* Cardiology evaluation — at the partner provider, the cardiologist performs the test, assigns a risk category using the traffic-light report, counsels the athlete on findings and next steps, and releases the result to the athlete only.

* Documentation and monitoring — the coach records only the color the athlete shares; the federation keeps only proof that the test was completed, with no access to the clinical report. Yellow or Red classifications trigger a recommendation for cardiology reassessment, never a disqualification.

This design ensures that the information needed for decision-making reaches the right parties at the right time, without any of them having to hold—or be held accountable for—clinical data they are not in a position to interpret.

COLOR-CODED RISK CLASSIFICATION (TRAFFIC-LIGHT REPORT)

To keep the communication of results simple and actionable—for both the coach and the athlete—the program uses a four-color classification anchored in the GLS and ejection fraction parameters discussed in Section 2.

Color	Criterion (LV GLS / LVEF)	Recommended Action
Green	GLS ≤ -18% and LVEF ≥ 50%, with no decline ≥ 1 percentage point from the previous exam (or first exam)	No abnormality identified. Reassess at the next competitive cycle.
Blue	GLS ≤ -18% and LVEF ≥ 50%, with a decline of 1.0 to 1.4 percentage points from the previous exam	Minor change. Reassess in 12 months, preferably at the same facility and on the same platform.
Yellow	GLS > -18% and < -16%, with LVEF ≥ 50%; or a decline ≥ 1.5 percentage points from the previous exam	Cardiology reassessment recommended after the show or within 6–12 months.
Red	GLS ≥ -16% and/or LVEF < 50%	Comprehensive cardiology evaluation strongly recommended before continuing prep.

This traffic-light logic serves a dual purpose: it lets the coach adjust training load and season planning based on easy-to-read information, and it keeps sensitive clinical data from circulating more than necessary—the coach knows the color, not the report. When more than one criterion applies, the higher-risk color prevails. When there is no previous exam, classification is based on absolute values alone; the change (delta) criterion applies from the second exam onward, ideally performed at the same facility and on the same analysis platform, given the documented variability across vendors (Farsalinos et al., 2015).

ATHLETE AWARENESS RECORD

Every athlete in the program receives and signs an Awareness Record, a purely informational document stating that they have received information about the cardiac risks associated with competitive bodybuilding and about the importance of annual strain echocardiography screening. The record is neither a liability waiver nor a consent form: it does not mention decisions, does not assign responsibilities, and does not describe the roles of

the other parties in the program. Its sole function is to document that the information reached the athlete—consistent with the protocol's central goal, which is to raise awareness, not to shift responsibility.

PROGRAM GOVERNANCE: AN INDEPENDENT COORDINATING BODY

The communication matrix and the structure of responsibilities described in the previous sections deliberately spread the program's operation across four parties, so that none of them holds decision-making power over anyone else. That distribution solves the problem of individual accountability, but it opens up a different gap: who keeps the system running, up to date, and consistent across federations, events, and partner clinics over time? Assigning that job to any of the four operational parties would bring back the very problem the design is meant to avoid—a federation that coordinates the program ends up regulating itself; a coach or cardiologist who coordinates it takes on a position of authority that goes beyond their individual relationship with the athlete.

The structurally sound solution is to assign governance to a fifth body, external to the other four and with no commercial or competitive stake in the outcome—a model already well established in other fields where separating those who set the technical standard from those who compete in or profit from the outcome is a condition of credibility, as with anti-doping agencies and research ethics committees, which are not run by the federations or researchers they oversee.

We propose that this role be filled by an Independent Commission on Cardiovascular Surveillance in Bodybuilding, set up not as a new, stand-alone entity but as a technical committee housed within an established and recognized sports cardiology society—in Brazil, for example, a department affiliated with an exercise and sports cardiology society, or, internationally, an equivalent arrangement with sports cardiology societies that already issue eligibility guidelines. Anchoring the commission in an existing scientific institution, rather than creating a new institute with no track record, gives the proposal immediate academic legitimacy and keeps the program's coordination from being seen as a commercial venture of

any single brand, event, or coach. To ensure that this commission truly remains independent, we propose four safeguards:

* Diverse membership and term limits. A rotating board with one representative of federations/events, one representative of coaches, one sports cardiologist who does not personally treat athletes enrolled in the program, one athlete representative, and one seat reserved for the host scientific society, all serving fixed terms (for example, two years, with a cap on reappointment) to keep the committee from being captured by any interest group. * Diversified funding, with no concentration. Funds drawn simultaneously from multiple federations, events, and partner clinics, with a cap on any single funder's share (for example, 25% of the annual budget) and public disclosure of funding sources, so that no sponsor has veto power over technical criteria. * Recusal rules. Any committee member with a direct commercial or professional tie to a specific athlete, event, or clinic must recuse themselves from decisions involving that case or partnership. * Regular public accountability. Publication of an annual report with aggregated, de-identified program participation data (number of exams performed, population distribution of colors), periodic technical review of the traffic-light report cutoffs in light of new evidence, and audits of the partner clinic network.

The commission's mandate is strictly administrative and educational: keeping the awareness materials up to date, managing the partner clinic network and discount agreements, and reviewing the protocol's technical parameters. Under no circumstances does the commission receive an individual athlete's report, rule on specific cases, or hold the power to bar any athlete from entering a competition—those prerogatives remain, respectively, with the treating cardiologist and with the athlete, as described in Sections 4.2 and 5. The Italian preparticipation screening experience cited in Section 2.1, which produced a sustained reduction in sudden death among young athletes, itself relied on a regional public health coordinating structure—separate both from each physician's individual clinical judgment and from any single sports club or federation—which further supports the plausibility of this governance model for competitive bodybuilding.

SUGGESTED INSTITUTIONAL AND REGULATORY PARTNERS

Although the SCSP was designed to work without centralized regulatory power (Section 3), its reach and credibility grow when existing public and scientific institutions each take on, within their own purview, the technical validation and application of the protocol. Brazil offers a direct precedent for this kind of arrangement: the health warnings on cigarette packs are the product of coordination between the Ministry of Health and the Brazilian Health Regulatory Agency (ANVISA) in defining, regulating, and enforcing those messages. The model is instructive precisely because it does not ban consumption—it standardizes and guarantees the information while leaving the decision to the individual—the same logic that drives the SCSP. By analogy, we suggest the following division of roles among potential partners, presented here as possibilities to be pursued rather than existing commitments:

* Sports cardiology institution (technical validation and application) — in Brazil, the Department of Exercise Testing, Exercise, Nuclear Cardiology, and Cardiovascular Rehabilitation (DERC) of the Brazilian Society of Cardiology and/or the Brazilian Society of Exercise and Sports Medicine (SBMEE); internationally, the sports cardiology section of the European Association of Preventive Cardiology, part of the European Society of Cardiology. This institution would validate the traffic-light report criteria, standardize strain acquisition and interpretation, accredit cardiologists/partner providers, and host the independent commission described in Section 4.6. * Ministry of Health (educational content) — much like its role in tobacco warnings, support or endorse the content of awareness campaigns on cardiovascular risk in bodybuilding, integrating them into existing public health initiatives. * ANVISA (regulatory oversight of AAS) — since anabolic-androgenic steroids are already controlled substances, contribute alerts and educational materials on their cardiovascular effects, standardizing the message conveyed by the campaigns. * Ministry of Sports (encouraging participation) — promote adoption of the protocol by federations and events, for example by making it a criterion for official recognition of, or institutional support for, competitions. * Federations and organizing bodies (execution) — carry out the program operationally, as set out in Section 4.1.

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Under this arrangement, none of the institutions ends up deciding for the athlete: the scientific institution is responsible for the technical standard, government agencies for the message and the incentives, and federations for execution—preserving the principle of awareness without prohibition that underpins the entire program.

ETHICAL AND LEGAL FRAMEWORK OF THE PROGRAM

The protocol is built on a deliberate premise: none of the parties involved—federation, event, coach, or cardiologist/partner provider—should hold veto power over an athlete's participation in competition. This choice does not reflect indifference to cardiovascular risk; rather, it reflects the recognition that imposing mandatory barriers, without formal regulatory backing and without consistency across federations, tends to be circumvented, producing information asymmetry and, paradoxically, lower screening uptake. Instead, the program bets on structured awareness: the athlete receives high-quality information, gets easier access to testing through partnerships, and decides freely and on an informed basis how to manage their career. The cardiologist retains full clinical autonomy and the duty to advise, without being cast as an obstacle to the athlete's career—which preserves the trust between athlete and clinician and lowers the risk that the athlete will withhold information. Athletes with a family history of sudden death or previously diagnosed heart disease deserve special attention. In these situations, the program recommends treating that information as an aggravating factor to be discussed more broadly—involving family members and the coach, when the athlete authorizes it—always within an enhanced awareness record rather than an automatic prohibition. The logic remains the same: the institutional role is to ensure that the decision is made with as much information as possible, not to override the athlete's will. From a legal standpoint, this architecture protects all four parties at once, precisely because none of them is placed in the position of deciding for the athlete or preventing them from competing:

* Federation/Event — demonstrates documented preventive action (campaign, partnership, proof of participation) without engaging in the practice of medicine and without

ever holding the athlete's clinical results.

* Coach — documents that they advised the athlete to get tested and that they received the color the athlete shared, without taking on responsibility for a clinical decision that is not theirs to make and without any power to turn the athlete away for not sharing information.

* Cardiologist/partner provider — preserves confidentiality and professional autonomy; advises and recommends, but neither clears nor prohibits the athlete from competing, and communicates with third parties only with the athlete's express authorization.

* Athlete — exercises autonomy over their own body and career, with full access to the information needed to decide; the Awareness Record documents only that this information was provided.

This division is what makes the program legally sustainable under current law: each party fulfills an obligation of means (to inform, advise, and evaluate), not an obligation of result (to prevent the adverse event), which is consistent with the principles of the Declaration of Helsinki on autonomy and informed consent in research and health care settings (World Medical Association, 2013).

DISCUSSION

The strength of this article lies in bringing together two fronts that rarely appear side by side in the sports cardiology literature: robust mechanistic evidence (strain echocardiography) and an institutional design that can be applied at scale, accounting for the real-world constraints of competitive bodybuilding—fragmented federations, the cost of specialized testing, and a culture of individual autonomy.

Compared with the mandatory screening models adopted in other sports, the SCSP offers an alternative path: replacing regulatory mandates—hard to implement in a sport with no single global governing body—with a system of incentives and visibility. Events that adopt the protocol publicly signal their commitment to athlete safety; coaches who build it into

season planning demonstrate professional due diligence; and participating athletes build a serial GLS history that allows intra-individual comparison across competitive cycles—a practice the strain literature already recognizes as more sensitive than comparison against isolated population cutoffs.

One relevant limitation is that the program depends on voluntary participation by federations, events, and athletes, with no enforcement mechanism. We would argue, however, that this limitation applies equally to any purely regulatory strategy in a fragmented sport—and that a well-designed, widely publicized voluntary protocol tends to generate organic adoption as partner events use it as a competitive and reputational differentiator.

Another limitation is technical: there is documented heterogeneity across strain platforms and vendors (Farsalinos et al., 2015), which calls for serial comparison of the same athlete at the same facility whenever possible, rather than relying solely on absolute cutoffs—a safeguard already built into the traffic-light report, which accounts for the change (delta) from the previous exam in the Blue and Yellow categories.

LIMITATIONS AND RESEARCH AGENDA

The evidence underlying this proposal has limitations already discussed in the source literature: moderate sample sizes in the imaging studies, frequently self-reported AAS exposure, predominantly cross-sectional designs, and underrepresentation of female bodybuilders. For the operational component of this article, there is the added absence, to date, of prospective data on uptake, cost-effectiveness, and the protocol's own impact on the incidence of cardiac events—an expected limitation for a proposal not yet implemented at scale.

As a research agenda, we suggest: (1) a multicenter pilot study assessing protocol uptake across partner federations and events; (2) longitudinal follow-up of participating athletes, with serial strain imaging and medium-term clinical outcomes; (3) an economic evaluation of event–health care partnerships, including the impact of discounts on testing uptake; and (4) cross-platform technical standardization of strain, enabling comparability

across the program's partner clinics.

CONCLUSION

Sudden cardiac death in competitive bodybuilding is no longer an anecdotal hypothesis but a measurable phenomenon, with an estimated incidence, a consistent anatomical substrate, and a sensitive functional marker—global longitudinal strain—capable of detecting subclinical dysfunction before ejection fraction changes. This evidence alone would justify routinely incorporating strain echocardiography into the evaluation of high-performance athletes in the sport.

What this article adds is a proposal for translating that evidence into field practice: the protocol proposed here is structured around clearly defined roles for the federation, coach, cardiologist/partner provider, and athlete; it is anchored in awareness rather than mandates; and it communicates results through a color system that protects both the athlete's autonomy and the cardiologist's clinical independence. It is a replicable, low-institutional-cost model, aligned with current sports cardiology guidelines, that federations and events can adopt as part of their preventive responsibility toward the athletes they represent.

Reducing sudden cardiac death in bodybuilding does not mean taking any athlete's competitive dream away—it means making sure that dream is pursued with as much information, active surveillance, and shared responsibility as possible across every link in the sport's chain.

CONFLICT OF INTEREST STATEMENT

The protocol presented in this article (Section 4) is proposed as a generic, replicable model, freely available for adoption by any federation, event, or health care provider interested in setting up a cardiovascular surveillance program for bodybuilding athletes, and is not tied to any specific brand or commercial product.

In the interest of transparency, the author discloses having independently developed a

practical implementation of this model under the trademark Unlock-Heart Check™, made available to federations, events, coaches, and athletes interested in adopting the protocol as part of their competition prep routine. This commercial implementation did not influence the selection, analysis, or interpretation of the scientific evidence presented in Sections 1 and 2 of this article, nor the strain echocardiography risk classification criteria, which reflect solely the literature reviewed. The author received no funding from the pharmaceutical industry, imaging equipment manufacturers, or sports governing bodies for the preparation of this article.

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