Towards a Determination of Which Weapons Cause "Superfluous Injury or Unnecessary Suffering"

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[Editor's Note: In March of 1996, M&GS published an article by Dr. Coupland entitled "The Effects of Weapons: Defining Superfluous Injury and Unnecessary Suffering" [M&GS 1996;3:A1], which represented the author's preliminary attempt to apply the epidemiology of the effects of weapons to international law. That article became the basis of a project, centered at the International Committee of the Red Cross, to develop objective criteria by which particular weapons can be categorized as inherently "abhorrent." The article that follows, based upon contributions from a number of project participants, is excerpted from a longer document edited by Dr. Coupland and published by the ICRC in September 1997. Readers wishing to obtain the entire document are encouraged to contact Dr. Coupland.]

An important legal concept in laws and treaties relating to the conduct of war is that a weapon should not cause "superfluous injury or unnecessary suffering" beyond the military advantage of the user. There has never been an objective means to determine what constitutes "superfluous injury or unnecessary suffering"; some weapons have been deemed "abhorrent" or "inhuman" but exactly what these terms mean has not been defined either.

The twentieth century has seen enormous human suffering caused by weapons; this does not appear to be diminishing. This suffering results from a combination of factors dependent on the design of weapons and factors which are user-dependent. Any use of any weapon against humans carries an intent to cause bodily harm. Understanding and quantification of that bodily harm can help to limit better the suffering from weapons current and future. In relation to policy and law, considering the real effects of weapons on humans before the weapons' technology is logical but at the same time is a reversal of current thinking.

Conventional weapons—for which there is no formal definition—utilize missiles or (non-nuclear) explosions and, as a function of their design, inflict physical injury by imparting kinetic energy but not foreseeably to a specified part of the body. Treatment requirements for this injury are well defined. The International Committee of the Red Cross (ICRC) has a database containing information on 26,636 war-wounded

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Health Professionals, Weapons, and the Law

Legislation about many health related issues originates with data collection, making concerns understandable and objective. Determination of which effects of weapons constitute "superfluous injury or unnecessary suffering" requires input of health-related data. Injury and suffering are health issues and so health professionals are in a position to help lawyers, governments, and the public to decide, using objective criteria, what is superfluous or unnecessary. Using medical data and arguments to support existing law is a responsibility of the medical profession; this has been recognized by the World Medical Association.

The effects of weapons on health should be the basis for legal, ethical, technical, or political decisions with respect to weapons; in other words, what weapons really do to humans should be the lowest common denominator for different professional concerns. Dum-dum bullets, which have an exposed lead tip and so splay open on impact with the body, were prohibited in 1899 on moral grounds because of people admitted to hospital. This database has been analysed to measure the collective effects of different conventional weapons[1] (i.e., the effects measured as a proportion of all people injured by a type of weapon).

By combining this data with data from military publications, certain effects of conventional weapons are quantified; any effects which are not equivalent can then be expressed in terms of four criteria which together provide a clear and objective distinction between the effects of conventional weapons and all others. The SIrUS Project comprises a group of experts who have worked to define the four criteria and who propose these criteria as a means to determine "superfluous injury and unnecessary suffering" from design-dependent, foreseeable effects of weapons when they are used against human beings to cause:

- specific disease, specific abnormal physiological state, specific abnormal psychological state, specific and permanent disability or specific disfigurement (Criterion 1); or
- a field mortality of more than 25% or a hospital mortality of more than 5% (Criterion 2); or
- grade 3 wounds as measured by the Red Cross wound classification (Criterion 3); or
- effects for which there is no well recognized and proven treatment (Criterion 4).

One or more of these criteria apply to all weapons which have already been prohibited. Blinding as a method of warfare, "point-detonating" antipersonnel mines, and the possible effects of new weapons are examined with these criteria in mind.

Weapons, Law, Injury and Suffering

Weapons: A Health Issue?

Weapons[2] are, by their design, a health issue [1,2]. This was recognized at the Montreux Symposium in March 1996 [3] and by the General Assembly of the World Medical Association in October 1996. The fact that the medical profession has responsibilities for this health issue was also recognized at both of these meetings. These responsibilities extend from the gathering of data about the effects of weapons on health[3] thus making the subject objective and understandable, to advocating limits on the means of warfare by invoking international humanitarian law and to educating governments, the public and the military about the effects of weapons.

Examination of the effects of weapons on health clarifies legal considerations in relation to technology and use of weapons. To limit better the human suffering from weapons both current and future, the nature of that human suffering must be understood and quantified. It has been pointed out that objective criteria for measuring suffering would provide a useful tool for lawyers [3,4]. It has also been noted that, in relation to chemical and biological weapons, there is no objective definition of what makes any particular weapon "abhorrent" [3] although this has not prevented the signing of treaties prohibiting the production and use of these weapons.

An Important Distinction: Design and Use of Weapons

When a weapon is used against human beings the factors that determine its effects on health relate to both the design of the weapon and the use of the weapon. The nature of injury is closely related to the design of the weapon. How many people are injured and who is injured are related to the use of the weapon. Which part of the body is injured may relate to either the design of the weapon or its use. A modern rifle may be used to inflict bullet wounds, each wound representing the deposit of energy of up to 2,500 joules to the human body [5]; this wounding capacity is the foreseeable effect resulting from the design of the weapon. When such bullets are either fired indiscriminately into a crowd or aimed by a sniper at the head of specific individuals, factors relating to use come into play which determine who is injured, their mortality and, for example, the proportion of wounded with limb injuries.

1. The data relating to "point-detonating" antipersonnel mines shows how the measured effects represent their foreseeable effect resulting from their design and these distinguish them from other conventional weapons. In this document the term "the effects of conventional weapons" does not include the effects of "point-detonating" antipersonnel mines.

2. Oxford English Dictionary defines a weapon as "material thing designed or used or usable as an instrument for inflicting bodily harm."

3. The World Health Organization definition of health is "a state of complete physical, mental and social well being."

By contrast, a "point-detonating" (buried) antipersonnel mine, when triggered by foot pressure causes traumatic amputation of the foot or leg—a foreseeable effect resulting from the design; user-dependent factors determine, for example, the number and kind of people injured. Retinal haemorrhage from a blinding laser weapon is obviously a design-dependent effect. The distinction between design-dependent effects and user-dependent effects is central to this document which focuses exclusively on the design-dependent, foreseeable effects of weapons.

An examination of the design-dependent, foreseeable effects of weapons must include the question of whether a weapon can be inherently indiscriminate. A weapon which injures both combatants and non-combatants alike does so most commonly as a result of user-dependent factors. However, indiscriminate effect may be design-dependent[4]; a topical example being antipersonnel mines [6,7,8,9]. This aspect of the design of weapons is not examined further here. There are legal instruments to limit the indiscriminate use of weapons; the same instruments also cover weapons which, as a function of their design, are indiscriminate.

Weapon Design and International Law

The concept that States' right to choose the methods and means of warfare is not unlimited has been generally recognized in treaties and custom for centuries. The most important treaty reaffirming this concept is the Hague Regulations of 1907 which was recognized as customary[5] by the Nuremberg Tribunal and recently the International Court of Justice recognized the fundamental customary nature of this rule [10]. The most recent treaty which repeats this rule is 1977 Additional Protocol I to the Geneva Conventions of 1949 [11]; 147 States are party to this Protocol.

These treaties and others incorporate the concept that any weapon system should not be of a nature to inflict "superfluous injury or unnecessary suffering" beyond the military purposes of the user and should not render death inevitable[6]. Whether the effects of a weapon might constitute "superfluous injury or unnecessary suffering" on the part of the victim have, up to now, remained within the realms of emotional or philosophical argument.

The first international treaty relating to the design of weapons was the St Petersburg Declaration of 1868 when a proposal made by the Russian Tsar banned bullets which explode on impact with the human body. Similar treaties were the Hague Declaration of 1899 which banned the use of dum-dum bullets, the Geneva Protocol of 1925 which banned the use of chemical and biological weapons and the Chemical Weapons Convention of 1993. (The use of poison or poisoned weapons has been banned by customary law for centuries.) Applying the principles of these treaties to existing weapons is difficult; applying them to weapons under development is much more difficult. At present, there is little control of research or development of weapons.

Another pertinent element of existing law is the Martens clause. This originated in the first Hague Peace conference in 1899, was repeated in the second peace conference in 1907 and has been carried forward into Additional Protocol I of the 1949 Geneva Conventions. It states that civilians and combatants remain "under the protection and authority of the principles of international law derived from established custom, from the principles of humanity and from the dictates of public conscience." That the Martens clause now constitutes an element of customary international humanitarian law has been recognized in the Advisory Opinion of the International Court of Justice on the "Legality of the Threat or Use of Nuclear Weapons," 8 July 1996 [10]. In addition, the extent to which policy makers are influenced by a strong public opinion on any issue is now well recognized. The effect on governments of the publicity campaigns aimed at a ban on antipersonnel mines is evidence of this.

The SIrUS Project

The principal element of the SIrUS

4. A weapon which is inherently indiscriminate is one which affects combatants and non-combatants without distinction i.e. even when aimed at or used for a military objective it will affect civilians in a way that the aimer or user cannot control.
5. Defined as general practice accepted as law.
6. This concept is to be found in the preamble to the St Petersburg Declaration of 1868 but it was not formulated until 1899 in the Regulations respecting the Laws and Customs of War on Land annexed to the Hague Convention of 1899. In the English translation of these regulations "maux superflus" was translated by "superfluous injury"; in the 1907 revised version this was replaced by the term "unnecessary suffering." Since 1977 "superfluous injury or unnecessary suffering" has been generally adopted as a more adequate translation.

the large wounds they produced. However, technology can circumvent the law by, for example, giving "legal" bullets a higher velocity so that they then have the potential to produce the same large wounds. If the health effects of small arms, which are measurable by a clinical wound classification [17,27-34], or which can be modelled in a laboratory [24], were used as the basis of considering bodily harm, the international law in relation to means and methods of warfare would not get bogged down in specifying technicalities of bullet construction; scientist, designer, lawyer, soldier, and surgeon would have a common point of understanding. A recent legal success is a new protocol, added to the 1980 UN Convention on Certain Conventional Weapons in 1995, which prohibits the use of laser weapons designed specifically for blinding [25,35]. In both cases, the technology of a weapon has been prohibited and not its foreseeable effect on human

The Sirus Project and Public Opinion

Criterion 1 reflects the question of whether weapons which target specific biochemical, physiological, or anatomical features or weapons which target vital organs or functions should be prohibited [3]. The process which takes knowledge of human form and function and then designs weapons to interfere with this form and function seem to be considered genuinely abhorrent.

It is no coincidence then that chemical, biological, and blinding laser weapons have been prohibited. This may reflect the distaste for biomedical scientists being involved in weapon design and is linked to the ethical dilemma that much modem weapon design is based on medical knowledge [3,35,36,37].

The measurable and foreseeable effects of conventional weapons provide a baseline and this baseline pertains to injury and suffering from weapons when knowledge of human form and function are not the primary factor in the design of the weapon. Thus, there is an Project is the consideration of the effect of a weapon before its technology; this is a reversal of current thinking. The project has involved a group of experts in the domain of weapons, medicine, law and communications who, first, have collated data relating to the effects of conventional weapons[7]; second, have used this data as a baseline for the consideration of the effects of all weapons; third, have defined four criteria which make an objective distinction between what constitutes and what does not constitute the effects of conventional weapons[8]; fourth, propose these criteria as a basis for determining which effects of weapons constitute "superfluous injury or unnecessary suffering"; and fifth, request endorsement of this proposal by professional bodies.

States have an obligation to determine the legality of any new means and method of warfare it is procuring or developing. The objective of the SIrUS Project is to facilitate such a determination without legal wrangling about certain technologies.

Generating a Proposal for a Determination of Which Weapons Cause "Superfluous Injury or Unnecessary Suffering"

A Combination of Concepts

The proposal for a determination of which design-dependent, foreseeable effects of weapons constitute "superfluous injury or unnecessary suffering" assumes:

- ß the effect of a weapon resulting from its design rather than the weapon's technology is the primary consideration;
- ß the effects of all weapons are measurable both on individuals and on groups of people;
- ß the effects of conventional weapons on health which are well documented provide a baseline of reference or yardstick for the foreseeable effects of all weapons when used against human beings;
- ß the degree of suffering inflicted by a weapon is increased if there is no treatment available.

7. There is no formal definition of "conventional weapons"; in this document the term refers to weapons in use by armies now which utilize missiles or (non-nuclear) explosions.

8. In this document, the term "effects of conventional weapons" does not include those of

Examination of the Criteria

Criterion 1: [the weapons causes a] specific disease, specific abnormal physiological state, specific abnormal psychological state, specific and permanent disability or specific disfigurement.

Criterion 1 provides an important distinction between the effects of conventional weapons (except "point-detonating" antipersonnel mines) and all other weapons.

The foreseeable psychological effects of weapons have been stressed [3,12]. Whilst all weapons produce fear and stress, these reactions are neither specific nor abnormal. Criterion 1 would apply to a weapon designed to disorientate, confuse, calm or precipitate seizures or psychosis [13,14,15,16]. In the same context, the known neuroendocrine response to physical trauma from conventional weapons is part of their effects [17,18]. The same neuroendocrine response produced by an agent or energy form without physical injury would represent a specific and abnormal physiological response.

Conventional weapons do not generate an absolute necessity for blood transfusion as shown in the study. Criterion 1 would apply to any weapon which, for example, foreseeably causes gastrointestinal haemorrhage and for which a blood transfusion would be needed to treat the effect. The implications for needing a blood transfusion are particularly important; without a reliable and safe blood bank, which is difficult to establish in a war zone, there is a risk of transfusing blood that has not been cross-matched or tested for transmittable disease such as syphilis, hepatitis B and HIV (the virus causing AIDS) [19].

The need for multiple operations compounds the suffering from the effects of weapons; those wounded by conventional weapons do not require, on average, more than 3 operations in a non-specialized surgical facility. Thus a weapon which, for example, as a foreseeable effect causes facial disfigurement would generate a necessity for multiple reconstructive operations in a specialized facility. Criterion 1 would apply and is linked to criterion 4.

Criterion 2: [use of the weapon results in] a field mortality of more than 25% or a hospital mortality of more than 5%.

The use of a weapon, the design of which renders death inevitable, is already prohibited in the same legal concept as "superfluous injury or unnecessary suffering." The study shows, for different cate-

Table 1 Proportion of the grades of first wound scored on the records of 8,295 patients injured by fragments or bullets

	Grade 1	Grade 2	Grade 3
Fragments(shell, bomb, grenade, etc.) (3,157 patients)	1,841 (58.3%)	1,054 (33.4%)	262 (8.3%)
Bullets (5,138 patients)	2,333 (45.4%)	2,296 (44.7%)	509 (9.9%)

The proportion of the grades of the first wound scored by the Red Cross wound classification in 8,295 patients injured by fragments and by bullets. The classification and the significance of the grade of the wound is explained in the text.

The 95% Confidence Interval (CI) on the presence of grade 3 wounds resulting from fragments is 7.3% to 9.3%; and that for wounds from bullets is 9.1% to 10.7%.

Table 2 Hospital mortality according to cause of injury in 8,672 patients who were admitted within 24 hours of injury

Cause of injury	Number of patiients	Number died (mortality %)
Fragments	2,926	118 (4.0%)
Bullet	2,706	124 (4.6%)
Burn	102	19 (18.6%)
Mine	3,028	121 (4.0%)
[Mine causing amputation	890	55 (6.2%)**]**

Mortality in 8,762 patients admitted to independent ICRC hospitals within 24 hours of injury according to cause of injury. "Mine" = all mine injured patients. "Mine causing amputation" are those patients who arrived with a traumatic amputation or underwent surgical amputation before dying; it is a subgroup of all mine injured.

The percentages dying by cause of injury are different (X^2 = 51.83 on 3 d.f., p<0.001). The percentages dying from fragments, bullets, and mines are not significantly different from each other (as shown by partitioning of the chi-square statistic (X^2 = 1.50 on 2 d.f., p>0.05) confirming that the overall significance is due to the high proportion dying from burns.

gories of conventional weapons, how constant are the figures for both field mortality and later mortality after the wounded person reaches medical care [12,20,21,22,23]. The figures for field mortality and hospital mortality must be considered separately because death from a weapon may follow days or weeks after injury as seen with burns and as shown in Table 2 of the study. The figures of 25% and 5% for field and hospital mortality respectively are proposed as limits which are on the conservative side of the established baseline.

Criterion 3: [the weapon] inflicts grade 3 wounds as measured by the Red Cross wound classification.

This criterion is needed to apply to weapons which although producing wounds without targeting a particular part of the body, simply inflict large wounds. This would be the case with exploding bullets and dum-dum bullets. Table 1 of the study shows that conventional weapons produce less than 10% grade 3 wounds. This figure would be exceeded by any missile or wave form which carries much more energy and which foreseeably deposits this energy in the human body over a short track.

As a means to move law from an approach orientated around technology—as exemplified by prohibitions on exploding and dum-dum bullets—to an approach orientated around effect, the Swiss government has proposed to States a means to test munitions for their potential to produce large wounds; application of criterion 3 to a weapon could be tested in a laboratory [24].

Criterion 4: [the weapon] exerts effects for which there is no well recognized and proven treatment.

Criterion 4 is linked to criterion 1. For the laser damaged retina there is no known successful treatment even in the best facilities. The effects of other new weapons are not fully known and so treatment is unlikely to be successful [15]. This criterion also calls into play the imbalance between the finance and technology that goes into the development of weapons on one side and, on the other side, the comparatively few resources that are made available to treat the wounded and record the true effects of weapons on health.

Applying the Criteria to Different Weapons

inevitable link between the Martens clause and criterion 1.
As there is proven treatment for the effects of few weapons to which criterion 1 would apply,
there is a link between the Martens clause and criterion 4 also.
Weapons from which a soldier cannot take cover,
whose use may not immediately be detected or which poison compound the notion of abhorrence.
Stigmatization of any weapon system is an important part of decreasing the chance of its use;
this applies not only to weapons which have been prohibited but also to napalm and to antipersonnel mines.
Endorsement of the SIrUS Project would provide an objective and precise means to focus public opinion so that a new weapon whose effect would clearly be "abhorrent" or "inhuman" would not have to be deployed before public conscience is moved.
The SIrUS Project as an instrument of public opinion runs parallel not only to the obligation of States to determine the legality of any weapon system they are develop-

ing but also to the responsibility of the medical profession to educate the public about health matters. The SIrUS Project provides a means for the medical profession to bring weaponry issues objectively into the public domain and at the same time to encourage the international community to recognize the seriousness of continued research and development of new means of warfare [1,3,14,16,36,37].

One or more of the four criteria apply to weapons which are already prohibited: criterion 1 and possibly criteria 2 and 4 apply to chemical and biological weapons; criteria 2 and 3 apply to exploding bullets; criterion 3 and possibly criterion 2 apply to dum-dum bullets; criteria 1 and 4 apply to blinding laser weapons. These criteria also apply to weapons which are subject to either a review of the law pertaining to them or stigmatization: criteria 1, 2 and 3 apply to "point detonating" antipersonnel mines; criterion 2 and possible criterion 1 apply to burning weapons.

Conventional weapons are not necessarily "lethal"; this is important when new weapons are considered in the context of the SIrUS Project. The term "non-lethal" has been applied to a new generation of weapons. It implies that technological advances have provided the means to achieve military objectives whilst minimizing deaths and injuries; a variety of energy forms, physical agents or chemicals have been developed [13,14,15,16]. This concept must be examined carefully from the point of view of the effects of such weapons.

The purpose is to "disable"—inflicting disability—but the difficult question of how long the person will be disabled for is not considered. If it is established what energy output, concentration or dose is "non lethal" or temporary, one has also discovered what is lethal or permanent. Thus for new weapons the dividing line between "non-lethal" and "lethal" may be fine or nonexistent. In tactical terms, new weapons will always be backed up by or used in conjunction with conventional weapons [13,14]; "softening the target" may increase the "lethality" of conventional weapons. In addition, a doctor treating the wounded may have to treat people suffering from the effects of both conventional and "non-lethal" weapons. All new weapons can and should be considered in terms of their effects and therefore the four criteria.

With regard to weapons that are designed to blind it has been argued that it is better to blind an enemy soldier than to kill him or her. This argument does not take into account that conventional weapons are not 100% lethal, the psychological impact of sudden blindness [25,26], the extent of disability or the impact on a society of its soldiers returning from battle having been irretrievably blinded. Criteria 1 and 4 apply.

Among other "non-lethal" weapons which should be studied in the context of the SIrUS project are chemical agents that renders a person useless, demotivated or unconscious for a short period without lasting effects. To such a weapon, if it exists, criteria 1 and 4 apply and whether they do so is arguable. However, there are three additional points to consider [16]: first, "softening the target" is still an important consideration; second, use of such an agent as a method of warfare is already prohibited under the Chemical Weapons Convention; third, a basic principle of pharmacology is that the only difference between a drug and a poison is the dose and it is unclear how the correct dose can be administered in the battlefield.

One cannot consider the effects of weapons in general without referring to nuclear weapons. Criteria 1, 2 and 4 would apply (burns and radiation sickness). The nuclear debate, which is discussed extensively in other fora, is not taken further in this document.

When assessing military utility, one must address the primary use of the weapon concerned. Weapons used, for example, to disable tanks or ships must be sufficiently destructive for this purpose. Although the crews themselves are protected by the legal concept of "superfluous injury or unnecessary suffering" they may still suffer severe injuries associated with a high mortality when attacked by such weapons [12]. Criterion 2 apparently applies; however, in this context, it cannot be used as a determination of "superfluous injury or unnecessary suffering" because of the military need to use such weapons. Criterion 1 definitely applies to an agent or energy form which would cause the crew to suffer, for example, epileptic convulsions.

Do Not All Weapons Cause "Superfluous Injury or Unnecessary Suffering?" Is Any Weapon Acceptable?

Can a weapon cause injury which is not superfluous? Is there such a thing as necessary suffering? These questions present a moral problem to pacifists, those who believe in complete disarmament and the medical profession.

Use of weapons must generate suffering. Whether use of weapons is necessary is a debate that falls beyond the scope of the SIrUS Project. Weapons are deemed neither acceptable nor unacceptable here. The project represents an attempt to limit the sort of weapons that might be used in war; this attempt will fail if the criteria are refuted because they do not represent total disarmament.

The SIrUS project involves making a clear and objective distinction between the effects of conventional weapons and the effects of others. Legal and moral judgement can then be applied to this distinction. Endorsement of the SIrUS Project is a recommendation that this distinction be recognized by States in their obligations under international law.

The medical profession is making neither a moral nor a legal judgement about weapons in explaining the effects of weapons in an objective and understandable way to lawyers, governments and the military. The paper adopted by the General Assembly of the World Medical Association states "No weapon is medically acceptable to physicians, but physicians can aid in making effective controls against weapons which cause injury or suffering so extreme as to invoke the terms of International Humanitarian Law." The SIrUS Project can help the medical profession to avoid a moral judgement by recommending the criteria as the means to make a legal judgement. Medical ethics are not breached as this initiative has the potential for prevention of specific injury; it is not aimed at preventing all injuries in war.

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