The Effect of Weapons: Defining Superfluous Injury and Unnecessary Suffering

Robin M. Coupland, FRCS

A database containing information about 17,068 war wounded patients is analysed, along with figures from military publications, to measure the collective health effects of weapons. The parameters by which these are measured are: proportion of patients surviving with very large wounds; patient mortality, both in the field and in hospital; duration of hospital stay; number of operations required; requirements for blood transfusion; the presence of severe and permanent disability in the survivors. Intentional blinding as a method of warfare is also considered. The author proposes that these measurable and collective effects of conventional weapons should be translated into a baseline of suffering and that any weapon or weapon system that exceeds one or more of these parameters can be deemed as causing superfluous injury or unnecessary suffering. These proposals represent a first attempt to apply the epidemiology of the effects of weapons to international law. They are extended to incorporate the standard of medical care that might be needed to treat the effects of a particular weapon and weapons of the future that may not be covered by existing treaties relating to conventional and non-conventional weapons for antipersonnel use. In the context of these proposals, the question is considered whether antipersonnel mines are conventional weapons on the basis of their health effects. This question must be considered at the second session of the Review Conference of the 1980 United Nations Convention on Conventional Weapons, due to be held in Geneva in April 1996. [M&GS 1996;3:A1]

The concept that states do not have an unlimited right to choose the methods and means of warfare has been generally recognised in treaties and custom for centuries. To date, 185 countries are party to the Geneva Conventions and 135 to Additional Protocol I; these are the most important treaties that uphold this fundamental humanitarian idea [1]. With respect to the design and use of weapons, these treaties state that no weapon system should render death inevitable, that weapons should not be indiscriminate in their effects, and that their effects should not inflict superfluous injury nor cause the victim suffering that is unnnecessary for the military purpose of the user.

The first international treaty relating to the design of weapons was the St. Petersburg Declaration of 1868: a proposal made by the Russian Tsar banned bullets that explode on impact with the human body. Similar treaties were the Hague Declaration of 1899, which outlawed the use of dum-dum bullets, and

At the time of publication RMC was on the staff of the Medical Division of the The International Committee of the Red Cross, Geneva, Switzerland

the Geneva Protocol of 1925, which banned the use of chemical and biological weapons. No objective analysis of unnecessary suffering led to these treaties; these means of warfare were simply deemed "horrific" or "inhumane."

The International Committee of the Red Cross (ICRC), among others, has called for a ban on antipersonnel mines, which do not discriminate between combatant and non-combatant, largely as a result of the catastrophic effect of the indiscriminate use of these weapons it has witnessed in countries such as Afghanistan, Cambodia, and Angola. This proposal was considered at the first session of the Review Conference of the 1980 United Nations Convention on Certain Conventional Weapons, which was held in Vienna in October 1995. Although the proposal is supported by a number of states and by the Secretary General of the United Nations, the conference failed to agree on how best to limit the indiscriminate effects of these weapons. Attention focused on the technology of self-destruct mechanisms or on a mine's detectability. Those in favor of a ban, however, have been unable to prove that these weapons cause superfluous injury or unnecessary suffering, which would render them illegal, despite evidence of their effect or their potential effect on the health of individuals or on that of whole societies [2-6]. A second session of the Review Conference will be held in Geneva in April 1996.

The ICRC has also called for a ban on intentional blinding by lasers as a method of warfare [7,8]. The Vienna conference adopted an additional Protocol that prohibits the use of lasers specifically designed for the purpose of blinding. The possibility of blinding by lasers of persons using optics, however, is not excluded. This partial legal success was certainly helped by the "abhorrent" notion of intentionally blinding enemy soldiers, but again there was no agreement that this amounted to superfluous injury or unnecessary suffering. Had there been such agreement, these weapons could be deemed illegal. An objective definition of this notion would help the formulation of international law in relation to these weapons and their use.

Weapons: Their Design, Use, and Effects

The indiscriminate effect of a weapon may reflect its design or its use; an indiscriminate effect can be documented if, for example, combatants and non-combatants alike are affected [2,5,6]. Superfluous injury and unnecessary suffering are more closely linked with the design of the weapon. Applying the principles of these treaties to the design of weapons is more difficult: first, there is little control of research or development of weapons; second, the effects of a weapon that might result in superfluous injury or unnecessary suffering on the part of the victim remain within the realms of visceral or philosophical argument. As weapon systems that have differing effects on the human body are being developed for potential military use, creating some yardstick of suffering to which the effects of weapons are applied becomes essential.

The effects of conventional weapons on an individual are measurable using the Red Cross Wound Classification [9,10]. In a clinical setting, this classification has been used to document the incidence of bullet disruption in armed conflict [11], the categories of wounds caused to civilians by hand grenades [12], and to refine the wounds according to structures injured and the extent of tissue damage in people injured by fragments or bullets [13-16]. From the score given to any wound its grade, denoting its size, can be computed: grade 1 corresponds to small penetrating or "low energy" wounds; grade 2 corresponds to "high energy" wounds (e.g., a bullet wound from a modern assault rifle); grade 3 corresponds to any wound larger than this (i.e., very large wounds).

The effects of weapons on wounded people collectively can also be measured by evaluating a number of factors, including:

* the mortality caused by a weapon system in the field (in military terms, those "killed in action"),
* the proportion of casualties that die after reaching a medical facility ("died of wounds"),
* the hospital mortality,
* the number of days the survivors have to stay in hospital,
* the number of operations they require,
* the number of units of blood they need during treatment
* the residual disability among the survivors.

Do these health effects represent a measurement of the suffering of those who are wounded by conventional weapons? Are these not the best measurements of suffering available? If the collective effects of conventional weapons can be measured, might not any effects in excess of an accepted baseline be deemed "unnecessary suffering?"

The wound database of the ICRC originates from a simple system of data collection that was originally designed to give the ICRC Medical Division an indication of the activities of its independent hospitals. Included in the information recorded is the cause of injury, the time lapsed between injury and

admission, the classification of the wounds [9], whether the patient has died, the number of operations, the number of units of blood transfused, the days spent in hospital, and whether the patient was discharged with amputation of one or both lower limbs. This system was installed in January 1991. Since then, all war-wounded patients who have been admitted to the ICRC hospitals of Peshawar and Quetta (Afghan border of Pakistan), Kabul (Afghanistan), Khao I Dang (Cambodian border of Thailand), and Lokichokio (Sudanese border of Kenya) have had a data form filled out upon their surgical discharge from hospital or death. At present, there are data relating to 23,767 patients.

In this paper, the author proposes, first, that figures representing the collective health effects of conventional weapons as indicated by the ICRC database and military publications provide the means to establish a baseline of suffering; and second, that if a weapon exerts, or is designed to exert, measurable effects beyond this baseline, the weapon concerned is deemed to cause superfluous injury or unnecessary suffering.

The attempt to define an objective baseline by which superfluous injury or unnecessary suffering can be judged must not be confused with judging war or a means of warfare as "acceptable" or "unacceptable."

Method

Refined data from the ICRC wound database (excluding those with incomplete records, those who were readmitted, and those who suffered blunt trauma or other injury) are available for 17,068 patients.

The refined database was analysed according to age and sex of the patients and the causes of injury. "Fragment" indicates injury from shell bomb, grenade, or mortar. "Bullet" indicates any gunshot wound. "Burn" indicates burn injury from any cause. "Mine injury" refers to anyone who was injured as a result of a mine explosion, whether the type was an anti-tank mine, a fragment mine, or a buried antipersonnel mine. "Mine causing amputation" is a subgroup of all the mine injured, but is taken to correspond broadly to those who have stood on a buried antipersonnel mine [2].

For those patients with fragment and bullet wounds and with the wound score of the Red Cross Wound Classification recorded, the proportion of the grades of the first wound scored was computed.

For those injured by fragments, bullets, burn, or mines and who were admitted to hospital within 24 hours, the mortality was computed. For the surviving patients of the same group the following was computed: the average number of days spent in hospital (this is the number of days to surgical discharge, excluding those who had to wait in hospital for political or geographical reasons); the average number of operations required; the proportion of patients transfused; the average number of units of blood transfused; and the total number of lower limbs amputated (this cannot be given as a proportion of all patients because of the small number who had bilateral lower limb amputation.) Those injured by mines who either arrived with traumatic amputation or who subsequently underwent surgical amputation were analysed as a subgroup of all mine injuries. In this part of the study only data from patients who were admitted within 24 hours of injury were analysed; therefore, data on those who had delayed access to medical care have not influenced the results.

Results

* Of the 17,068 patients, 5,976 (35.0%) were females, males less than 16 years old, or males 50 years old or older.

* Table 1 shows the proportion of the grades of first wound scored on the records of 5,125 patients injured by fragments or bullets.

* Table 2 shows the hospital mortality according to cause of injury in 7,975 patients who were admitted within 24 hours of being wounded.

* Table 3 shows , according to cause of injury, for the 7,615 surviving patients: the average days spent in hospital; the average number of operations; the proportion of patients transfused; the average volume of blood transfused in units; and the number of lower limbs amputated.

Discussion

This study introduces the idea that the health effects of weapons can be measured on an epidemiological basis and that this has relevance to current international law. This permits humanitarian consideration with respect to the effects of weapons to be viewed as one medical subject, rather than as a series of different legal, military, or technical subjects.

Most people would now accept that war, however horrific must be waged with weapons of a certain ferocity and technology. Most people would also accept that the effects of conventional weapons exert enough suffering, if not already too much. Therefore the health effects of conventional weapons could become a yardstick of suffering against which to measure the effects of all weapons;

anything beyond these effects would then be defined as unnecessary suffering. This study permits an objective line to be drawn.

When patients are admitted to an ICRC hospital, their military status is neither asked for nor recorded. Thus the organisation cannot be seen to be accumulating information of military value. There are no means to establish how many individuals die before reaching hospital. That at least 35% of the patients could be presumed "non-combatant" reflects the reality of modern conflicts. It is the opinion of this author, who has worked as a surgeon in all of these ICRC hospitals, that non-combatants have greater difficulty finding transport to either the first aid posts or to the hospital and that only a small proportion of the casualties from the conflicts concerned (certainly less than 10%) actually reach an ICRC facility.

Table 1, shows that whilst the proportions of grade 1 and grade 2 of the first wound scored in patients wounded by fragments and bullets differ [16], the proportions of grade 3 wounds are similar. The similarity of the proportions of grade 3 wounds (the largest and the most likely to cause superfluous injury or unnecessary suffering) gives a possible baseline relating to size of wound. The majority of bullet wounds seen in the ICRC hospitals are from the Kalasnikov AK47.

A review of data from military medical sources, who know the number of fatalities in the field, shows how little the mortality has changed since World War II. The proportion of wounded who die in the field varies between 18% and 22% [17,18]. Likewise, the proportion of all casualties who die after reaching a medical facility varies between about 2.5% and 4.5% [17,18,19]. This gives a baseline proportion of deaths among casualties that has been accepted by military and political leaders as a consequence of wars waged in this period of history. (Although it is not clear if this will remain so given the nature of recent conflicts such as Somalia, Bosnia, and Rwanda.) The figures for hospital mortality given in Table 2, are comparable, except for those who suffer burns. As the plight of burn patients is particularly miserable, this elevated hospital mortality in the ICRC facilities represents a lingering death; this justifies claims that a weapon that intentionally burns people, such as a flame thrower, exerts unnecessary suffering. In addition, the medical facilities required to improve the survival from burn injury simply cannot be made accessible to victims of modern wars without enormous input of finance and specialised personnel.

The surgical facilities of the ICRC work with a basic level of technology, employ non-specialist surgery, provide no onward evacuation to better facilities, and place emphasis on certain basic principles of surgical management [20,21]. The baseline standard of effective treatment provided in ICRC facilities is often better than that normally available in the countries where war is being fought. Therefore, the argument that suffering might be reduced by provision of high technology and specialised medical care, thereby changing the relevance of these measurable health effects, cannot be upheld.

Table 3 shows how antipersonnel mines that are buried and that, by design, cause traumatic amputation of a lower limb (a grade 3 wound), drain hospital resources to a much greater extent than do conventional weapons. They also inflict permanent and severe disability on anyone who survives injury. Days spent in hospital, the number of operations, and the requirement for blood transfusion are all greater in this group; this relates to the volume of severe tissue damage that the surgeon must treat [2,22,23]. Most people would regard leaving the survivor with severe disability as an infliction of

Table 1.

The proportion of grades of the first wound scored by the Red Cross wound classification in 5,125 patients wounded by fragments and by bullets.

[The significance of the grade of the wound is explained in the text.]

	Grade 1	Grade 2	Grade 3
Fragments (shell, bomb, grenade etc)			
(2,311 patients)	1,357 (58.7%)	755 (32.7%)	199 (8.6%)
Bullets			
(2,814 patients)	1,261 (44.8%)	1,299 (46.2%)	254 (9.0%)

Table 2.

Mortality in 7,975 patients admitted to independent ICRC hospitals within 24 hours of injury, according to cause of injury. "Mine" = all mine injured patients. "Mine causing amputation" = those patients who arrived with a traumatic amputation or who underwent surgical amputation before dying; it is a subgroup of all mine-injured patients.

Cause of Injury	Number of patients	Number died (mortality %)
Fragments	2,699	115 (4.2%)
Bullet	2,432	121 (4.9%)
Burn	87	15 (17.2%)
Mine	2,757	109 (3.9%)
[Mine causing amputation	818	53 (6.4%)]

Table 3.

Data from 7,615 war-wounded patients who survived, relating to days in hospital, operations per patient, blood transfusion, and lower limb amputation. All patients were admitted to independent ICRC hospitals within 24 hours of being wounded. The number of lower limb amputations cannot be given as a percentage of all patients because of the few who require bilateral amputation. "Mines" = all mine-injured patients who survived; "Mine causing amputation" = those mine-injured patients who survived with either a below-knee amputation, an above-knee amputaion or bilateral lower limb amputation.

	Total survived	Average days in hospital	Average number of operations	Proportion transfused(%)	Average units of blood given	Number of lower limbs amputated
Fragments	2,584	13.7	1.9	14.2	0.4	55
Bullet	2,311	18.1	2.1	16.4	0.5	19
Burn	72	19.5	1.8	9.7	0.3	0
Mine	2,648	21.5	2.8	33.3	1.3	859
(Mine causing amputation	765	32.3	4.0	74.9	3.2	859)

unnecessary suffering. The combining of these measurable health effects with the facts that, first, ejected fragmentation mines cause a 100% mortality among those who trigger them [24] and, second, all mines can be indiscriminate in their effect, supports and justifies the ICRC call for a ban on the production, stockpiling, and use of antipersonnel mines of whatever design.

Taking this argument further, these measurable effects not only indicate superfluous injury and unnecessary suffering in relation to the design of a weapon but buried antipersonnel mines are arguably not even a conventional weapon because of their health effects. Obviously, the counterargument takes the line that the military utility of such weapons justifies their use in the face of these health effects.

Nine Proposals for Defining Superfluous Injury and Unnecessary Suffering

Using the figures given in this paper, a list of health effects can be proposed by which any weapon system could be objectively judged to inflict superfluous injury and unnecessary suffering. These are:

1. A field mortality of more than 25% of all casualties.
2. A hospital mortality more than 7% in a medical facility adequately equipped with basic and non-specialised facilities.
3. Infliction of more than 10% grade 3 wounds among those who survive to hospital.
4. The necessity for the survivors to stay in hospital on average more than one month.
5. The necessity for more than 3 operations in a non-specialist hospital with a basic level of technology.
6. The necessity to transfuse more than 20% of the survivors.
7. The inevitable infliction of permanent disability.

How then do we regard a weapon that is designed to blind the victim permanently? This is a severe disability, but proponents of blinding laser weapons have argued that it is better to blind the victim than to kill him or her. The ICRC does not accept this argument which takes into account neither that a conventional weapon, such as a rifle, kills (only) about one quarter of the casualties nor the psychological impact of sudden blindness [7]. It is also pertinent that the best medical facilities available are unlikely to be able to salvage the sight of someone whose eyes have been targeted by a laser; access to such facilities in war would be difficult, if not impossible, especially if there were many casualties with this injury. Therefore, the ICRC has called for a ban on intentional blinding by lasers.

The medical profession, as well as the ICRC, must recognise the full health effects of weapons, measure them, and, by possibly using the proposals above, carry the responsibility to define superfluous injury and unnecessary suffering.

In an editorial, the Lancet proposed that the profession carries a greater responsibility with respect to weapons than simply treating the wounded; this refers to medical knowledge being used to develop future weapons [8]. The continued development of so called "non-lethal weapons" and some directed energy weapons depends on knowledge of pathophysiological or psychological effects. A soldier may not even know an attack is taking place, may not be able to protect himself

or herself, may not be able to surrender and, if wounded, may find that no means of treatment awaits him or her. Most people consider warfare waged with weapons developed in laboratories by biomedical scientists unacceptable; this has led to the conventions that prohibit chemical and biological warfare. "Non-lethal weapons" and directed energy weapons are not, as yet, covered by a specific international treaty. Two more proposals, therefore, are reasonable:

8. The primary effect should not be to target a specific part of the human anatomy, physiology, or biochemistry.

9. The injuries of the survivors should be treatable in a non-specialist facility.

Proposal 9 addresses the imbalance between the finance and technology that goes into the development of weapons on one side, and, on the other side, the resources made available to research and record the true health effects and to treat the wounded.

These nine proposals can be applied to any weapon system, present or future. For example, exploding bullets would be banned under proposal 1 and dum-dum bullets would be prohibited in the context of proposal 3. Buried antipersonnel mines could be deemed to cause superfluous injury or unnecessary suffering by proposals 3, 4, 6, and 7; proposal 8 could also be applied, since the weapon targets the lower limb. Incendiary weapons fall under proposal 2. Laser weapons used to blind intentionally come under proposals 7, 8, and 9. These proposals must also apply for humanitarian concerns surrounding the effects of non-lethal weapons to be reasonable.

Current thinking is reversed if the health effects of weapons are considered first and their technology second. The responsibility for the subject of superfluous injury and unnecessary suffering from weapons is thereby put on the shoulders of the medical profession; it is not left to technical, legal, or military considerations. If the proposals above are adopted, promoted, and voiced by the medical profession, they may influence public opinion, governments, and, eventually, international law relating to armed conflict. Despite international treaties, one may still argue that, when it comes to war, the military must have every means possible to achieve its objectives.

Perhaps it is the responsibility of the medical profession to help a society decide which weapons are to be put in the hands of its military? ❧

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