Utility of ALARP principle in application of precautionary principle for purposes of medical device regulatory decision

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April 2012

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Publisher

Published by Quality First International (division of Adveniunt Medical International Limited), Suites 317/318, Burford Business Centre, 11 Burford Road, Stratford, London 15 2ST, United Kingdom

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Introduction

The ALARP principle constitutes an element of the now-disfavoured EN ISO 14971 standard, yet continues to be used to overcome insufficient or incomplete quantitative scientific evidence on the hazard profile of a medical device, including assessment of risk, evaluation of post-production phase (experience) performance and regulatory decisions, the latter including by regulators. This essay examines the principles and practice of ALARP, explores whether it offers consistency and considers its robustness for use in medical device regulation.

ALARP or "as low as reasonably practicable" is one of a triad of principles (along with "as low as reasonably achievable" and "so far as is reasonably practicable"). The principle is most popularly embedded in English Law– hence applied mainly in the United Kingdom – however, enjoys wider use afield [Bedford, in Melnick, Everitt (2008)].

Responsibility for testing that risk is ALARP resides routinely with the Competent Authority but ultimately with the duty holder, in the case of medical devices, he is the economic operator: the Manufacturer. Whether the law has been violated by ALARP considered valid by the Manufacturer but not by the Competent Authority resides ultimately with the Courts.

Unfortunately, while the ALARP principle has been adopted into Law, little case law exists to provide guidance [Bedford, in Melnick, Everitt (2008)]. Therefore, the views of the regulator in the form of guidance remain just that, largely un-tested in court. Nevertheless, the principle can be considered suitable for direct cause and effect pairs, although less so where multi-factorial situations exist, such as survival and morbidity following treatment by a medical device. Therefore, when applying ALARP principle, it is necessary to simplify the nature of the risk to an individual risk with a specific outcome of discrete probability (or incidence). It is important to recollect that EN ISO 14971, for instance, permits semi-quantitation, meaning that (precise) figures are inessential although desired and preferred. It is equally important to understand that semi-quantitation must be logical, plausible and justified. Use of semi-quantitation is, of course, attractive, since use of medical devices, consequential complications and incidence are generally unavailable in the form of actuarial figures , therefore an individual risk, *eg*, infection resulting from a specific un-sterile central venous catheter must be related to the societal risk (frequency with which events lead to multiple infections). This can be accomplished

by a frequency-number curve, for instance. Risk measures may also be normalised by exposure time, *eg* by fatal accident rate (FAR).

Council Directive 93/42/EEC espouses certain principles, quintessential among which are the Safety Principles [Atchia, (1997)]. Benefit: risk therefore infers it is permissible for elimination of a particular risk to not be achieved (perhaps because it is impracticable, hence not ALARP), hence tolerated in return for its benefits obtained through the activity generating the risk.

This was represented by the tolerability of risk (TOR) guidance by the HSE (1988) which introduced the (TOR) triangle (Figure 1). The triangle features an ALARP region. Although not conceived for medical devices, the TOR guidance limits somehow migrated culminating in limits evident in EN ISO 14971 and ultimately applied without exploration of plausibility and accuracy by Manufacturers. In order to substantiate the level of risk determined for use in ALARP situations, application of probabilistic safety analysis or quantitative risk analysis seems unavoidable [Bedford, in Melnick, Everitt (2008)], however, reminds that such analyses do not substitute for good engineering practice, of course).

Although a categorical, unequivocal legal definition appears difficult to find, the ALARP region may be represented as follows graphically [HSE (2001)] (Figure 1).

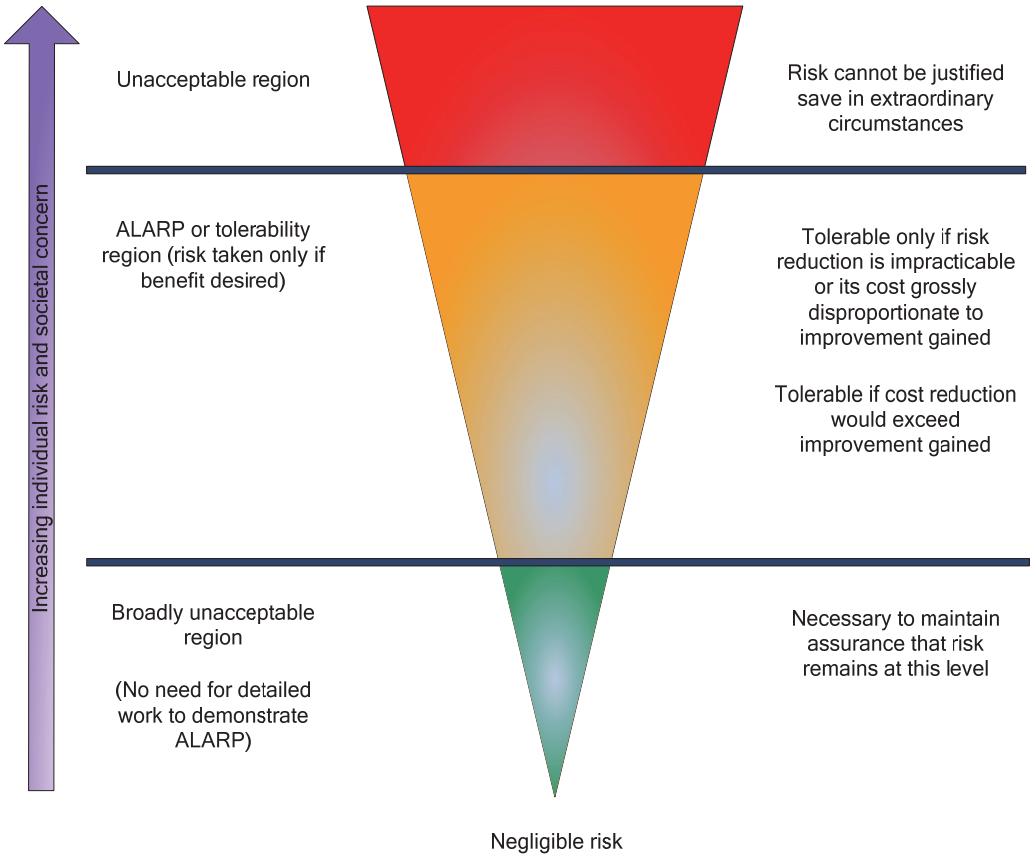

Figure 1 TOR triangle (based on HSE framework for tolerability of risk

Balance of risk and concomitant sacrifice to reduce the risk

The legal test of balancing risk and concomitant sacrifice that manifested in ALARP requires analysis of cost: benefit. This quantification is often mis-represented as an actual valuation of human life but in fact is the unit cost to achieve a certain averaged risk reduction. Experience, however, suggests that the Competent Authority does not apply the latter, rather the former context – evident in politically risk-averse decisions such as precautionary recall of product when in fact concomitant risk cannot be estimated with scientific certainty; consider also concerns about the toxicity of phthalates to humans [Kamrin (2009)]. Further examination of this notion is outwith the scope of this discussion.

Several workers criticised ALARP because of the problems with the cost: benefit element. Its use is argued predominantly because of the absence of actuarial figures, other indicators such as failure, reliability data and evidence-based therapeutic outcome, however, official guidance from the Competent Authority may prove helpful to improve uniformity throughout the medical device sector. ALARP is already the guiding principle of UK risk-based regulation, providing good basis for consistency of decisions across different sectors [Bedford, in Melnick, Everitt (2008)], despite use of arbitrary choices in risk limits, value of preventing a fatality, *etc*. Consistency is, however, undermined by emotional decisions rather than sanguine reliance on scientific evidence by the regulator as far as medical devices are concerned, therefore improvement in official guidance would be necessary.

Drawing on the recommendations of the House of Commons select Committee for Science and Technology submission by the Royal Statistical Society about the risk perception and energy infrastructure (2001), application of numerical values to ALARP calculations, including semi-quantitation should respect the following:

(i) separate different types of hazards experienced, *eg* acute, transient to short-term from chronic, long-term,
(ii) separate impact on patients, users, others and other products used in routine medical applications where the device concerned is used,
(iii) include both quantifiable hazards (risks) and those that are important but difficult to quantify,
(iv) for quantifiable hazards (risks) use whole numbers for clear metrics in comprehensible units,
(v) determine uncertainty attached to numbers applied to quantitation, justify precision of numbers evidentially,
(vi) separate voluntary and involuntary risks for each hazard origin,
(vii) provide multiple formats and ways of expressing hazards, *eg*, probability, rate or incidence and impact on the patient/patient population, *etc*
(viii) understand that the past does not necessarily predict the future, hence remain objective and impartial,

(ix) clarify extent to which estimates of hazards (risk) reflect scientific models, emphasise assumptions,
(x) acknowledge uncertainty and limitations of data and knowledge,
(xi) acknowledge any disputed science,
(xii) attempt to give a balanced view that does not seek, or appear to seek, to persuade.

The position of ALARP in other EUMS beyond the UK would be influenced by the prevailing legislation used for risk control, meaning that although use of ALARP may be encouraged by a Notified Body – especially one designed by the UK, un-explored application may be unwise.

Appendix § D.8.1 EN ISO 14971 considers a residual risk acceptable when that risk is reduced to its lowest practical level, bearing in mind benefit of its acceptance and (taking into account the) costs of further reduction.

The Standard continues that when establishing the risk acceptability policy, the manufacturer might find it convenient to use an as-low-as reasonably-practicable approach (Figure 2).

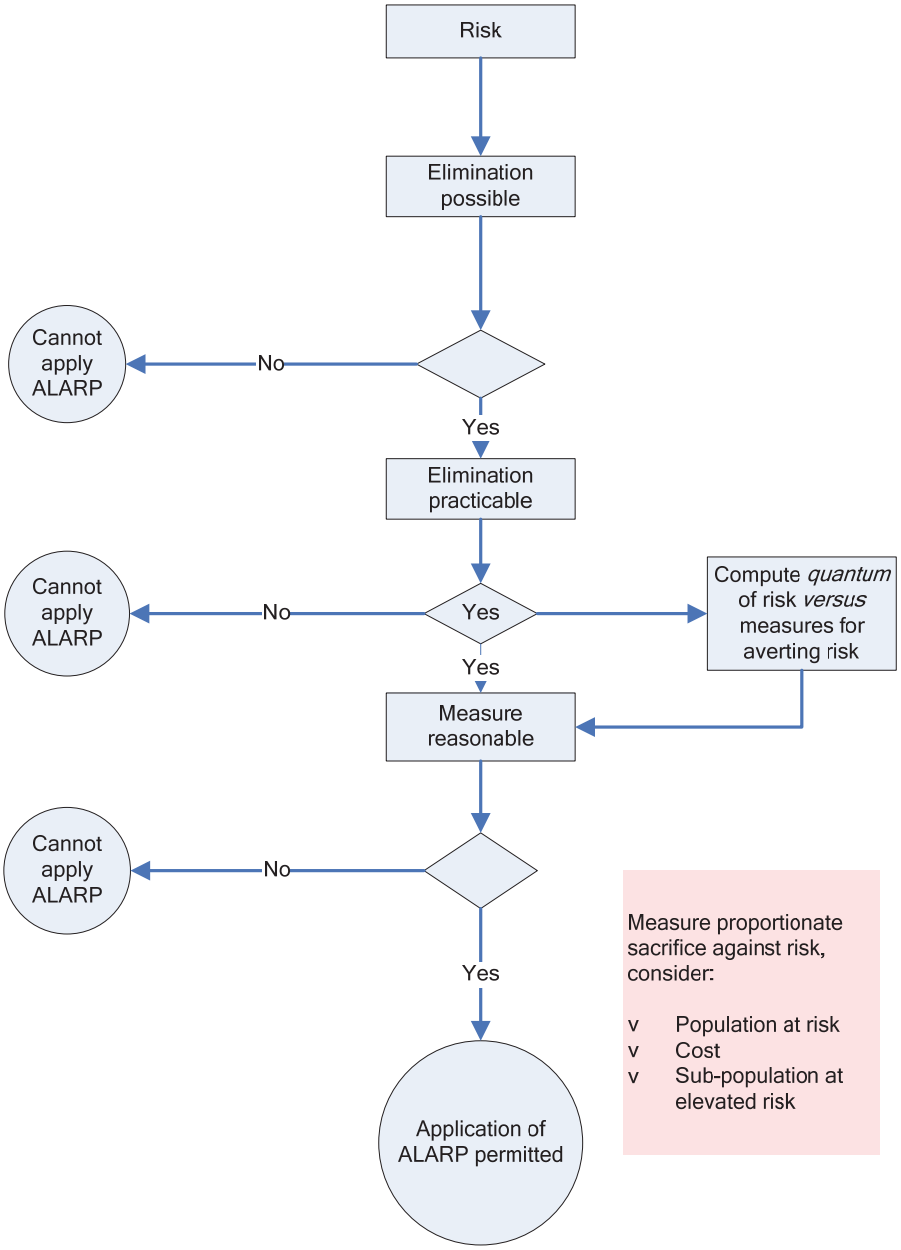

Figure 2 ALARP process

After a particular risk control option has been applied, three possible results emerge:

a) the residual risk exceeds the manufacturer's criterion for risk acceptability,
b) the residual risk is acceptable because it is so small as to be negligible

or,

c) the residual risk is between the two states specified in a) and b); for these risks the residual risk is acceptable for the option that reduces the risk to the lowest practicable level, bearing in mind the benefits resulting from its acceptance and taking into account the costs of any further reduction.

The as-low-as-reasonably-practicable approach can be used as part of risk control options analysis (§6.2 EN ISO 14971).

Risks for which the probability cannot be estimated would normally use the as-low as-reasonably-practicable approach.

The Standard therefore permits acceptance of Benefit: risk reduced to ALARP practical, not practicable, which means a lower threshold of achievement, however, recognises suitability of the principle. It is important to recall that although the Standard is not Harmonised, its use is encouraged and expected by Notified Bodies for Conformity Assessment. Therefore, eligibility of the principle by regulatory authorities and the Courts in each EUMS should be known.

Summary

Consideration of what is a reasonable effort to avoid causing damage (harm in the context) at a certain level of risk, when damages cannot be excluded completely led to the development of ALARP or ALARA in the United Kingdom [Ale (2005)] founded on the ruling by Lord Justice Asquith (1949). Ale observed the importance of differences in the particular Law controlling hazards in a particular EUMS must also be understood. Studying the Laws of The Netherlands and United Kingdom, Ale explained that although both are based on some sort of quantitative expression of the sorts of risks, differences between them can work out completely differently; extrapolating, that could mean hazards concluded as ALARP and acceptable to the United Kingdom could even be considered unacceptable in another Country such as The Netherlands, even though risk criteria and interpretation in the two Countries appear very similar. Consequently, this is an area that perhaps should be described better when the new regulations on medical devices are formulated, although it is unclear now how differences in the Common Law system in the UK and Napoleonic Laws will be reconciled.

Research has failed to reveal any case Law on validity of application of the concept reasonable practicability such as ALARP, ALARA and SFAIRP for medical devices. In fact, no record of any injunctions embodying the concept was discovered. Therefore, precedent in other areas such as health and safety may offer some insight. In the United Kingdom, for example, the gross disproportion test is used by the HSE to decide whether duties imposed on a duty holder to control risks are reasonably practicable: if control fails the gross disproportion test, then ALARP *etc* cannot be accepted.

Furthermore, the starting point for such determination is the present situation, *ie*, translating to the current not prevailing State-of-the-Art when considering medical devices.

It is accepted, however, that in certain circumstances, it is impossible to assess options in this way. In such situations, the starting point should be an option known to be reasonably practicable (such as one representing existing good practice).

Any other options should be considered against that starting point, to determine whether further risk reduction measures are reasonably practicable.

Bibliography

1. Bedford, T As low as reasonably practicable/as low as reasonably achievable, p38-43 in Melnick, EL, Everitt, B Encyclopedia of quantitative risk analysis and assessment (Editors) John Wiley & Sons Ltd (2008) ISBN 978-0-470-03549-8.
2. EN ISO 14971
3. Council Directive 93/42/EEC of 14 June 1993 concerning medical devices. *Official Journal of the European Communities*, 1993, **L169**, 1 (12 July 1993).
4. HSE The tolerability of risk from nuclear power stations HMSO, London (1988) (revised 1992).
5. HSE Reducing risks, protecting people HSE's decision-making process (2001) ISBN 0 7176 2151 0.
6. Slavin, D Some thoughts on tolerability of risk – a framework for decisions? Pfizer Global Research and Development.
7. Atchia, H When is a new device a new device? *RAJ (Devices)* 5 (2), 86-92 (1997)
8. Royal Statistical Society House of Commons Select Committee for Science and Technology Inquiry into risk perception and energy infrastructure (2011).
9. http://www.addington-barker - info/alarp.php
10. Peace, C The tolerability of risk – misunderstood, misapplied or missed altogether? Risk Management Ltd.
11. Kamrin, MA Phthalate risks, phthalate regulation, and public health *J Toxicol and Environ Health*, Part B, 12, 157–174 (2009) ISSN: 1093-7404 print / 1521-6950 online DOI: 10.1080/10937400902729226 .
12. Ale, BJM Tolerable or acceptable: a comparison of risk regulation in the United Kingdom and in The Netherlands *Risk analysis* 25 (2), 231-241 (2005).

Disclosure: *The author has no financial disclosures that might pose or create a conflict of interest with respect to information presented in this article. No external funds were received.*