

ORIGINAL PAPER

HEALTH RISK MANAGEMENT MATRIX - A MEDICAL PLANNING TOOL

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Abstract

This paper describes the Health Risk Management Matrix. This is a planning tool, developed at the Defence Medical Services Training Centre, to teach students how to develop and write a Medical Force Protection Plan. The tool covers 5 stages: hazard identification, identification of the population at risk, risk assessment, control measures (divided into information training and policy, medical counter-measures, and treatment) and monitoring activities. The paper provides a worked example using malaria as a hazard.

Keywords: force protection, risk assessment

Introduction

NATO medical policy defines Medical Force Protection (MFP) as the conservation of the fighting potential of a force so that it is healthy, fully combat capable, and can be applied at the decisive time and place. It consists of actions taken to counter the debilitating effects of environment, disease, and selected special weapon systems through preventive measures for personnel, systems, and operational formations (1). British military medical doctrine describes a planning process, Health Risk Management (HRM), that facilitates the creation of a medical force protection plan (2-4). As such, it is also a key element of the Medical contribution to the overall military planning cycle (Estimate) process.

Existing UK legislation (5) and MOD Policy (6) on Health and Safety (H&S) determines that commanders at all levels, have a permanent responsibility for ensuring that military activities are undertaken in the safest possible manner and with due regard to any risks to their personnel. This responsibility applies in barracks, during training and on operations. Thus Health and Safety policy is subordinate to, but an integral component of, the concept of Force Protection (7). The application of HRM should ensure that medical staff provide Commanders with the necessary advice and practical support to enable them to meet their legal responsibilities under Health and Safety legislation consistent with the practical realities of military operations.

Whilst teaching these doctrinal principles and related procedures at the Defence Medical Services Training Centre, it was found that the description of the HRM process described in medical doctrine did not equip students with the skills to produce adequate plans to manage the risks from hazards to health in exercise scenarios. This article describes the 'Health Risk Management Matrix' that teaches military personnel to identify, assess and manage risks to the health of a military population. This framework is currently taught to all members of the Defence Medical Services who attend training and courses delivered by the Department of Environmental and Occupational Health at the Defence Medical Training Centre. Students have found it an effective learning aid and instructional staff

have noted a substantial improvement in the quality of plans to protect health in exercise scenarios.

Health Risk Management

British Army medical doctrine summarises HRM as a linear process with 5 stages (Fig 1). The dotted lines represent a feedback loop to ensure that any adverse changes in the health of the population at risk (PAR) are accompanied by actions to improve the management of the health risks identified during the HRM process. The experiences from those teaching HRM were that students were aware of service policies in regard to specific hazards but had difficulty converting this knowledge into a practical plan for implementation. Furthermore the linear description of HRM benefited from the introduction of the idea that Risk Management should be accompanied by a process of monitoring the interventions designed to reduce risk rather than waiting until the medical surveillance systems had detected health effects.

The HRM matrix was designed to provide a format for the collation of background information and to encourage students to interpret background policies into a list of positive actions. The use of a matrix

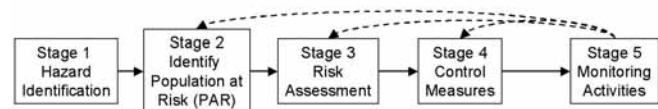


Figure 1 Health Risk Management Process

allows students to consider how to monitor their risk management plan concurrently with their interventions thus introducing the idea that their responsibility as a medical planner includes ensuring that their plan actually works. Figure 2 shows the HRM matrix completed for malaria by a Regimental Medical Officer or Unit Health Adviser at unit level involved in a disaster relief operation in Africa. The completion of each element of the HRM matrix is discussed below.

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Figure 2 Health Risk Management Matrix completed for malaria

HAZARD		POPULATION AT RISK Op & Activity Dependent	RISK ASSESSMENT Theatre, Op & Activity Dependent
MALARIA Refs: SGPL. JSP 371. Theatre MIA Med Wng Notice		(Humanitarian Op) All Own Tps/Pers C2 / C3 & Specialist Friendly Forces/NGOs Locally Employed Civilians Displaced Persons / Refugees Displaced Persons/Refugee Children	Very High Very High Very High Medium Medium High
		RISK ASSESSMENT	
		CONTROL ACTIVITIES	MONITORING ACTIVITIES (Audit and Surveillance)
RISK MANAGEMENT	GENERAL CONTROLS	<p>Communal Vector Control</p> <p>Physical</p> <ul style="list-style-type: none"> Avoidance or removal of breeding sites: <ul style="list-style-type: none"> - Drainage or removal of mosquito breeding sites. - Camp/unit dry day – once a week. - Camp siting & segregation. Use nets on windows and doors of accommodation / tents <p>Chemical</p> <ul style="list-style-type: none"> Residual insecticide on structures, harbourage or resting areas. Knockdown insecticides: <ul style="list-style-type: none"> - Swing fog dawn & dusk - Knockdown aerosols in accommodation. Larvicidal treatment of mosquito breeding sites (Abate). Vector control carried out as per JSP 371. <p>Individual Bite Avoidance</p> <p>Physical</p> <ul style="list-style-type: none"> Bite prevention: <ul style="list-style-type: none"> - Use of bed nets. - Clothing - long sleeves and trousers at dawn and dusk. <p>Chemical</p> <ul style="list-style-type: none"> Peripel for clothing and nets (JSP 371 – Chap 46B). Insect repellent on exposed skin. 	<ul style="list-style-type: none"> Local Med Int. Case Identification/Reporting. Breeding site surveys. Bite rates / reports. Camp /site inspections. <ul style="list-style-type: none"> o Op Sanitation & Camp Hygiene o Screening/Netting o Knockdown insecticide use Hygiene Diary / Vector Control Log entries: <ul style="list-style-type: none"> o Unit dry days. o Swingfog routines. o Site inspections. o Peripel issue / treatment: <ul style="list-style-type: none"> - Clothing - Nets o Abate dosing. o Residual spraying. Use and serviceability of bed-nets. Pesticide application recorded and effectiveness assessed. Check dress states/SOPs.
	INFORMATION, TRAINING & POLICY	<ul style="list-style-type: none"> Health Intelligence & Med Recce. Health Education (MHIT Pre-deployment). <ul style="list-style-type: none"> o Bite avoidance o Communal measures o Chemo-prophylaxis regimes Vector & Hygiene control specialist trained personnel. Divisional SOP's to be prepared, according to health intelligence. In-theatre reinforcement of Health ed/trg. 	<ul style="list-style-type: none"> Local Med Int. Arrival/Induction Trg. Vector control operatives. Examples of reinforcing information sources, SOPs and orders. Warning Cards carried.
MEDICAL COUNTER-MEASURES	<ul style="list-style-type: none"> Appropriate Chemo-prophylaxis for own tps. (MWN or DCI JS 172 / 2001), incl alternative regimes. Removal of individual from theatre if severe reaction occurs to C-P. Warning cards. 	<ul style="list-style-type: none"> Chemo-prophylaxis issue / parades. Monitoring of drug related adverse effects. Warning Cards carried. 	
TREATMENT	<ul style="list-style-type: none"> Early identification of suspect cases. Appropriate symptomatic treatment/care. Diagnostic sample and analysis to confirm parasite. Definitive treatment/care. Treatment arrangements for Displaced Persons. 	<ul style="list-style-type: none"> Case Notifications - FMed 85 UNHCR/NGO/HN case reports. Lab IDs / reports. Morbidity returns (J97). Adherence to treatment protocols. Evac of cases. Post deployment - case ID and tracking. 	

STAGE 1 HAZARD IDENTIFICATION

The first stage in HRM is to identify all of the potential hazards to the health of the Population at Risk (PAR). The Medical Intelligence Assessment and the Medical Warning Notice should provide this information but this may need to be complemented by other sources of information. Hazards should be considered in the following hierarchy:

- (1) Conventional battle hazards eg. bullet, bomb, blast.
- (2) Non-battle traumatic hazards eg. road accidents, training accidents.
- (3) Infective hazards
- (4) Chemical hazards
- (5) Radioactive hazards
- (6) Environmental hazards
- (7) Psychological hazards
- (8) Ergonomic hazards

The medical planner should generate a HRM matrix for each of the hazards identified. It is suggested that these should be organized on paper or electronically so that they can be readily reviewed, updated and retrieved for audit. At this stage background reference material and policies should also be obtained and reviewed for each of the hazards identified. These might include Surgeon General Policy Letters (SGPLs), Joint Service Publications (JSPs), the theatre Medical Intelligence Assessment (MIA), the theatre Medical Warning Notice (Med Wng Notice) or other publications.

STAGE 2 IDENTIFY POPULATION AT RISK

The medical planner should identify the entire PAR for whom he is responsible. The definition of the PAR may need to be categorized in order to distinguish between difference levels of exposure or vulnerability to a threat, or to distinguish between the significance between different levels of impact of failures in medical force protection measures. Examples of such PAR groupings might include:

- (1) Own forces (i.e. OPCON – under operational control) e.g. headquarters, acclimatized/unacclimatised, occupational or trade groupings (e.g. catering staff, staff in special protective equipment, medical staff), specific operational tasks (reconnaissance, guarding, flying).
- (2) Grouped Joint and Combined forces (i.e. military forces at all other states of command).
- (3) Civilians e.g. UK civil servants, UK contractors, Non-Government Organisations, locally employed civilians, local liaison personnel.
- (4) Enemy forces and Prisoners of War.

This stage of the process may include plotting locations of hazards and PARs on a map to provide a graphical illustration to support the risk assessment process.

STAGE 3 RISK ASSESSMENT

Risk Assessment helps Commanders and their staff to prioritise and allocate resources for medical force protection. The primary purpose is to evaluate the importance of health hazards and to compare the risk between different hazards. These will normally be expressed as a composite of qualitative judgments regarding the likelihood of exposure to a hazard and the potential severity of the outcome. The two dimensional matrix described for the general assessment of operational risk shown in Figure 3 may be utilised for this purpose (8). In the example shown in Figure 2, the risk to deployed forces and NGOs from malaria is considered to be both very high and high priority. The risk to children in the displaced population is the next highest risk and priority and so on

Under health and safety legislation, Commanders have a general duty to reduce all risks 'so far as is reasonably practicable' which in turn will

Severity	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	Extreme	Extreme	High	High	Moderate
Critical	Extreme	High	High	Moderate	Low
Marginal	High	Moderate	Moderate	Low	Low
Negligible	Moderate	Low	Low	Low	Low
Chronic	Differed				

Figure 3 Matrix for Assessment of Operational Risk

depend greatly on the prevailing operational circumstances and imperatives (5). As an example, many communal anti-malarial measures are impractical when conducting a reconnaissance patrol in the jungle where the consequence of being discovered and shot at by an enemy is greater than the consequence of catching malaria. However individual measures such as the use of insect repellants and taking anti-malarials are therefore extremely important and should be actively supervised.

Other legal standards may apply such as for occupational exposure to chemicals where 'exposure should be reduced so far as is reasonably practicable and in any case below the Maximum Exposure Limit' (9), or for exposure to ionizing radiation when the standard is 'as low as reasonably achievable and must not exceed certain exposure limits' (10). The extent to which control measures can be implemented and enforced will be highly variable dependent on the nature, phase and intensity of operations. Commanders therefore need to be aware of the inherent risks in order to make valid risk decisions and place proper emphasis on implementation and monitoring of remedial control measures.

STAGE 4 CONTROL ACTIVITIES

There are a number of components to Control Activities listed within Risk Management. These have a defined hierarchy in UK legislation. The components are shown below:

Control Measure	Malaria control
Remove the hazard.	Use of Swingfog or other insecticide to kill mosquitos. Avoid remove all standing water.
Remove personnel from the hazard.	Ensure only deploy those personnel strictly needed for the operational task. Exclude those for whom malaria would be medically catastrophic such as pregnant personnel and those who have had a splenectomy.
Isolate or enclose the hazard	Put high risk areas (eg. undrainable standing water) out-of-bounds.
Isolate or enclose personnel	Fit insect screens to fixed accommodation. Use bed nets.
Control exposure (eg. Work/rest cycles)	Withdraw personnel from high risk areas from dawn to dusk.
Provide personal protective equipment	Issue Permethrin impregnated clothing.

Figure 4 – Example of Hierarchy of Control Measures.

General Control Measures. This describes measures taken to reduce the probability of personnel suffering ill-health from the hazard. Figure 4 shows the hierarchy of control measures that should be considered (11) and examples of their application for malaria.

Information, training and policy. The provision of information, instruction and training is a critical element of the implementation of UK legislation (12) that must be reflected in military Medical Force

Protection. All personnel will need to be educated and trained in regard to the health hazards of a specific deployment and how to minimize the risk of personal ill-health. The mandatory Military Annual Training Tests (MATTs) specify the mandatory health promotion training that all army personnel should receive each year. This should provide a background level of knowledge. The Mobile Health Instruction Team will supplement this with a 'just-in-time' pre-deployment health brief covering the health hazards specific to a particular military operation. This can be reinforced during the theatre arrival brief. Individual aide memoires and entries in Theatre and Unit Standing Orders may also be used. Finally health warning cards such as the Malaria Warning Card (F Med 568) may be issued to all personnel prior to their return to UK.

Medical countermeasures. Medical countermeasures are prophylactic immunisations or medications that can be prescribed to reduce the risk of an adverse health event. This may involve immunisations (eg. Tetanus, Typhoid and Polio), pre-exposure drug treatment (e.g. Anti-malarials, NAPS, BATS), or post exposure prophylaxis (eg. use of human immunoglobulin to prevent Hepatitis B after a needlestick injury), and this will be promulgated in the Medical Warning Notice with medical staff being responsible for the prescription and supply of these drugs. In the worked example, the Medical Intelligence Assessment will advise on the choice of anti-malarial for a particular region and population.

Treatment resources required. The amount, nature and disposition of the treatment resources required will relate to the risk assessment. Medical staff will need to ensure that a robust plan is in place to treat any individual who succumbs to the health hazard. Treatment resources may be tailored to a specific casualty estimate or may be considered as an 'insurance policy' which requires a critical mass whatever the magnitude of risk. In the worked example in Figure 2, specific arrangements for the rapid investigation and treatment of febrile service personnel in case of malaria are required. The medical facilities need to have appropriate therapeutic and supportive therapies (possibly including intensive care and access to urgent aeromedical evacuation) readily available.

STAGE 5 MONITORING ACTIVITIES

The effectiveness of Medical Force Protection must be measured by monitoring activities based on a combination of audit of policies and procedures and health surveillance to detect failures in risk management. As an example, Unit Environmental Health Duties personnel may be tasked to inspect camps for standing water and other potential mosquito breeding sites as part of their duties in pest control. Individual blister packs of drugs can be checked at random to check tablets have been used. Nominal rolls can be used as registers to record the application of insecticides to issued equipment in accordance with policy.

There are a number of tools that assist health surveillance including CHASP (13), J97 (14), and F Med 85 communicable disease reporting. In the example, individual cases of malaria should be reported using a F Med 85 and any local case-reporting system with

J97 being used to record cases of febrile illness on a population basis. Commanders and their staff must ensure that they make maximum use of such tools to provide feedback on the effectiveness of Medical Force Protection measures.

CONCLUSION

This paper has described a practical approach to Health Risk Management using a structured matrix as a prompt to assist a medical planner in the production of a Medical Force Protection plan. This is demonstrated as a worked example using malaria. The methodology described has been used in training courses at the Defence Medical Services Training Centre and is reported to improve students' abilities to produce a Medical Force Protection plan.

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