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Editorial

Dr Malcolm J Valentine (editor@irhc.co.uk)

The Journal of the IRHC:

'The Journal of the Institute of Remote Health Care (IRHC) exists as a means by which information can be published and ideas exchanged among the International Remote Health Care Community. Provided as a benefit to IRHC Members, Affiliates and Corporate Members, it seeks to broaden understanding of the specialty of Remote Medicine and to promote the interests of all the practitioners and others involved in supporting remote health care provision. The Journal provides a platform for publication of material that will contribute to the quality development of remote health care. The Journal is edited in the UK – but is focussed on issues relevant to wherever there is remote health care provision – all 'corners' of the globe. The Journal has now acquired its own status as a significant contributor to quality development in international remote health care. Further information on publication requirements are listed towards the end of the journal'.

Welcome to the July 2015 edition of the Journal!

This edition runs to quite a few pages more than usual, thanks to two extremely important papers that we are publishing in full.

The first paper by Gibson - Smith *et al* is a definitive review of the health and wellbeing of offshore workers. This paper comprises a detailed review of available evidence and represents a very careful analytical review of it. It sets a line in the sand for where we are now with the health of offshore workers, delving into a number of appropriate domains and those that are now looking at developing criteria for the healthcare of remote workers should be guided by this paper. I anticipate it being widely cited over the next few years.

Our next paper by Smart and Mark looks at multiple casualties in remote industrial locations. Again, representing a very thorough analysis, it complements the paper by Gibson - Smith *et al* by looking at the other end of the spectrum of the remote healthcare practitioner i.e. acute casualties. Again, I anticipate this paper being cited appropriately as guidance is further developed on the role of the remote healthcare practitioner.

To start the journal, the leading article is by a retired consultant orthopaedic surgeon of some repute in Aberdeen. Ken Mills harboured a lifelong ambition to at least in part retrace some of the experiences of Sir Ernest Shackleton's great Antarctic epic of 1914 - 1916. For all those involved in remote healthcare, it

really is one of the epic journeys man has ever made. Ken doesn't re-tell the story - you can do that for yourself (and you should) but he reflects on some of the issues of healthcare that must have seemed overwhelming on that journey of 100 years ago.

We have a contribution from John Quinn - a regular contributor reviewing the great contribution of the American paramedic Patrick Chellew. You sometimes wonder how great developments happen and you often wonder just how something did happen in the face of great adversity. Well - this article tells you how one person can effect massive change in just such adversarial circumstance. Read the article and just ponder some of the petty, insular squabbles that we are all frequently exposed to. It makes you think ...

There's some further reflection from Simon Harvey in the journal - again a regular. A short article that does provoke another bit of reflection - you will see what I mean when I read it.

Finally, after Nelson's Column, there is an obituary to the late Alan Milne. Its brief - but Alan contributed massively to the early development of mush of remote healthcare. I had the pleasure of working with him at the old Centre for Offshore Health. A great man.

Again, I have to say what an utterly brilliant selection of material. I am grateful to those that have contributed such interesting articles for everyone to share. I say it every time - it requires a bit of discipline and effort to do this - but it's a skill well worth developing and retaining. In this age of rapid, real time information dissemination, the need to consider an issue through reflection, enquiry and subsequent careful narration has never been greater. How else are we all to learn?

In reading the journal - maybe you, reader, could consider whether there is something in your work or experience that you want to get out into a wider audience. If so, then the editor would be more than happy to engage in helping with the production of any publishable material.

Keep these articles coming folks!

Malcolm Valentine

editor@irhc.co.uk

Nelson's Column

July 2015

The first part of the year has seen the guidance document completed following modifications from a large number of interested stakeholders and the definitive document is now on the web-site and hard copies have now arrived and will be sent to both individual and corporate members. This can only be regarded as a beginning to the establishment of the international educational process required to produce a competent, international, remote healthcare practitioner for the global energy industry.

The second main issue was the discussion on the assimilation of the IRHC into the Royal College of Surgeons of Edinburgh. The college has now agreed this and the IRHC Council has welcomed it. A joint steering group has been established to achieve this and a joint operational group set up to discuss progress in a variety of directions such as education, research, membership categories, communications, business development, etc. This constitutes a major step forward because the extensive educational and research technology and experience of the college will now be available and progress will be greatly speeded up with the support and resources of a major and credible academic institution. It seems likely that the IRHC will retain its identity and direction of travel but with the support and governance of the college.

It will now be possible to pursue the necessary research to compliment the guidance document as its provisions are converted into curricula and courses by the educational providers but these courses will now be accredited by the college and the trainees examined by the college and awarded appropriate levels of membership, supported by post –nominal suffixes so that we will at last see the emergence of recognizable new specialist practitioners, regulated by education and performance rather than dubious forms of regulation in much the same way as other health professionals such as anaesthetists and surgeons gain both national and international acceptance and recognition.

Meanwhile the research thrust of the IRHC has been undergoing development and relationships established with a number of associated areas both at home and overseas. In particular the establishment of an academic base in the Middle East has been sought for some time and the Zayed Centre for Health Science in the UAE University in Al-Ain seems likely to provide an MoU with IRHC in the near future. This follows the promotion of joint research projects between the Rural School in Inverness and the group in Abu Dhabi. This could see the establishment of an international research centre and allow a Scottish research base where the international project on the implementation of the provisions of the Guidance document can be promoted. It will be necessary not only to determine the state of knowledge of the current practitioners in the Middle and Far East but also the curricular adjustments necessary in view of the differing disease patterns, environments and legal rules. Since remote healthcare is a dynamic situation this research process requires to become an on-going surveillance thing rather than a one off study and this is a benefit of establishing the IRHC as an academic institution in a credible major international institution, which is independent of bureaucratic and commercial interference. Many pairs of hands will be required and IRHC members wishing to be involved will be welcomed and could also acquire career development of personal value in the process.

When both Aberdeen Universities closed their offshore medical centres about the turn of the century there followed a period of virtual stagnation in the necessary research and development of this dynamic area of healthcare. The Institute of Remote Healthcare, established in 2007, has attempted to remedy this by listening to the concerns of the practitioners which were largely on professional isolation, lack of professional status, variable training courses, and lack of CPD and absence of regulation. These concerns have now been addressed by the IRHC and a system promoted which will guarantee international professional recognition and status, much improved research based education, membership of a highly regarded professional body, regulation by education and

international qualifications and continuing surveillance, which is ensured by the journal, the web-site, the annual conferences and the establishment of the research unit. Finally, the Association of Corporate Members which has just been initiated will allow frequent interchange of views between the industry and the IRHC council.

Award for Chairman of IRHC Council

The Institute is delighted to announce that the Royal College of Physicians and Surgeons of Glasgow awarded the Chairman of its Council, Professor Sir Lewis Ritchie, the honorary FRCP of its Royal College of Physicians at an impressive ceremony at the Bute Hall of the University of Glasgow. While this award recognises Sir Lewis' very distinguished career and his major contribution to the healthcare of the nation it must be said that it also reflects on the interest he has taken in remote healthcare recently and thus on his assumption of the Chair of the IRHC Council.

The pending assimilation of the Institute into the Royal College of Surgeons of Edinburgh marks a major step forward in the emergence of the international remote healthcare practitioner as a new specialist of medicine and which the Institute has been promoting and developing for some years. The international position of the college will assure that its members have due recognition but the additional credibility gained by recognition of its Chairman by its sister Royal College must add considerably to the place which the IRHC membership will soon occupy in the international scene.

From left to right: Sir Lewis Ritchie, Chairman of IRHC Council, Dr Frank Dunn, President Royal College of Physicians and Surgeons of Glasgow, Professor Nelson Norman, IRHC President.

J Nelson Norman.
President, IRHC

July 2015

An Obituary

Dr Alan Henry Milne

Dr Alan Milne – a notable figure in remote health care medicine died of disseminated prostatic cancer on 9th May 2015 aged 74. He died at home with his devoted wife Moira and his family at his side having borne a painful debilitating illness with great courage and without complaint.

Following graduation with MB, ChB from Aberdeen University in 1967, he spent a year as a base doctor with the British Antarctic Survey on Adelaide Island. This was followed by a spell in the submarine service of the Royal Navy. In 1976, he was on Elephant Island where Shackleton's 1915 expedition made landfall after Endurance sank in the Weddell Sea as one of two doctors with the Joint Services expedition.

He was expert in Diving Medicine and in the 1980's was heavily involved in the provision of diving medicine to the oil industry in the North Sea. There was significant decompression sickness particularly among air divers in that period. He was also involved in the care of many amateur divers who suffered decompression sickness in Scapa Flow in the Orkney Islands. He remembered by many as being a gifted teacher of diving medicine although he found it an ordeal.

Later he became Senior Medical Officer to the British Antarctic Survey Medical Unit established in Aberdeen by Professor Nelson Norman. This unit was responsible for health care on the British Antarctic bases. There was a doctor on each base who received additional specialist training in Aberdeen. Their day to day work was supervised remotely from Aberdeen using telex and later fax and satellite telephone.

He was widely regarded as a perfect gentleman - a pipe smoking man of great humility, kindly, shy and self-effacing. He will be greatly missed.

Graham Page Moira Milne

May 2015

Leading Article

Shackleton's Centennial and West Antarctica

- a poignant return to the Antarctic wilderness in 2014

Mr Ken Mills
Consultant Orthopaedic Surgeon (retired)

kenneth.mills3@virgin.net

Introduction

Sir Ernest Shackleton's expedition of 1914-16, designed to cross the Antarctic continent for the first time, was a total disaster in every respect in that the western party lost everything they possessed except life. The eastern party from Australasia suffered very severely to no purpose and lost 3 men, but it is Shackleton's crew and their endurance that has become famous.

One of the 2 doctors with Shackleton was Alexander Macklin who in later life was the doctor for the students and the nurses at the Royal Infirmary, Aberdeen. At ages 74 - 76 he claimed to be ' the oldest orthopaedic house surgeon in the world'. It was there that I worked with him while he ignited my interest in the Polar regions. For this reason I joined a cruise in 2014 to follow Shackleton's tracks around the edges of western Antarctica 100 years after the event.

Photograph 1 - The Ship

The Experience

70 elderly enthusiasts were joined by 20 or so grandchildren of Shackleton's crew on a Russian ice-breaker sailing out of Ushuiaia for 3 weeks. We made 14 beach landings in very remote coves from Zodiac inflatables. We had all been vetted before signing up so no one fell into the icy waters and no

one was injured or became sick. I found I was the oldest on board, but was supported by my son-in-law, an endocrinologist (is there a joke here?).
He made an indelible mark with a vital Heimlich manoeuvre on an old man who had inhaled a bit of steak 1 hour before sailing. Otherwise, there were 2 ships doctors - a Russian lady for the crew (numbering 53) and a South African lady for the passengers et al.(numbering 93) The sick bay was well equipped for minor dentistry and surgery, radiography and ECGs. There were 2 beds and stocks of drugs from USSR and USA.

As we sailed far from civilisation and had no helicopter, life threatening emergencies could have been problematical. There was a wealth of medical experience on board with 2 retired General Practitioners and several scientists.

The biological security took us by surprise (although it is probably commonplace to those who travel to distant parts of the world) Maybe this is holding back the progress of evolution? After leaving the Falklands we were invited/required to turn out all the pockets of our garments to have the corners vacuum cleaned. The Velcro strips were inspected and every tiny fragment removed. All our footwear was inspected and the soles scrubbed. Hand washes proliferated around the ship and were thoroughly used. All passengers were issued with high quality survival suits of the correct size, boots and flotation harnesses. On going ashore, all had to walk through trays of antiseptics, and on return all had to stamp about in the waves to remove the worst of the seal and penguin poo. On the ship the trousers and boots were scrubbed in the antiseptic trays again. No one was allowed to excrete on shore and a 3 - 4 hour abstinence was mandatory! Of course, not a fragment was thrown overboard and I saw no one smoking.

At Port Stanley Falkland Islands there is a modem hospital for 3,500 inhabitants staffed by a succession of specialist locums from all parts of the world. My impression from this trip and 2 trips of 20 years ago was of high quality treatment. Medical evacuation is by sea or air to Montevideo in Uruguay, as Argentina tries to cut all links with 'Las Malvinas'. Indeed, we had a young Argentinian naval officer on board as an observer. Maybe a KGB man as well?

On South Georgia the abandoned whaling stations at Grytviken and Stromness etc. have only a few inhabitants in the Austral summer, but cruise ships nowadays can give varied support (water, showers, food and medicine intermittently). Over-winterers of the British Antarctic Survey are on their own. This applies also to the members of other nationalities who have bases in the Antarctic. I will not mention my gall-stone cholecytisis in 1996, but I am alive!

We were intrigued by the extermination of rats from South Georgia (140 miles by 30 miles). They came with the sealers and whalers in the 19th century and had a very bad effect on birds which nested on land and soil as they ate the eggs. The bird population fell rapidly. South Georgia lends itself to segmental extermination because of the glaciers which separate parts of the island. In the past 10 years a big international effort has gone into their extermination by poisoning. This seems very successful but is not complete so far. The reindeer population, introduced in 1910, is now almost extinct. Husky dogs as a foreign species were removed in 1965. Fur seals, almost exterminated in the early 1900s, have made a huge recovery as a secondary effect of the decimation of the whales. Both species depend on krill. We saw large numbers of fur seals on the beaches but not many whales out at sea. Presumably they breed more slowly.

When will humans remove themselves from Antarctica as a logical progression of this train of thought? The prospect of oil and gold etc is perhaps too alluring.

The wildlife in Antarctica is thrilling. There is no fear of mankind. The air and the seas are teeming. Birds take no notice when nesting, penguins seem to think that humans are a new species of their own kind. Seals are not bothered, but elephant seals 'beach masters' do not like to be challenged by any moving object.

Photograph 2 - Penguins on Salisbury Plain, South Georgia

There were 3 days of bad weather at sea during the trip, but 4 - 5 days of perfect weather. We were able to penetrate King Haakon Fjord on the South-West coast of South Georgia but a westerly gale stopped us from entering the Drygalsksi Fjords on the South-East tip. A storm prevented us from landing on Elephant Island, where 22 of Shackleton's crew waited for 4 months for rescue in 1916. What a forbidding place. Black cliffs, overhanging glaciers, westerly blizzards sweeping down! Ice packs prevented us from approaching the Wordie hut (1931); disappointing to the Wordie grandchildren who wanted to see what their grand-father had achieved in the 1930s.

However, the weather was perfect in the Falklands, on Salisbury Plain on South Georgia and at Paradise Bay on the Antarctic Peninsula. A BBQ in shirtsleeves on the afterdeck at + 1 C was delightful!!

The erudite passenger company filled every moment with new information. It was a happy ship.

Ken Mills
Feb. 2015

Mr Ken Mills
Consultant Orthopaedic Surgeon (retired)

kenneth.mills3@virgin.net
(submitted February 2015)

Original Articles

The health and wellbeing of offshore workers: a narrative review of the published literature

Gibson Smith K, Paudyal V, Stewart D, Klein S
Robert Gordon University
Aberdeen, UK

Email: v.paudyal1@rgu.ac.uk

Abstract

Recent developments within the offshore industry have highlighted the role that health and wellbeing plays in ensuring the safety and longevity of the offshore workforce. Developing an understanding of the overall health and wellbeing of offshore workers could aid future developments. This narrative review aims to identify and synthesise the relevant published literature on offshore health and wellbeing. The Cochrane Library, Cumulative Index to Nursing and Allied Health Literature, Medical Literature Analysis and Retrieval System Online, PsycArticles, and Web of Science databases were searched with publication search dates limited from January 1994 to November 2014. Twenty-six studies were identified and covered aspects of occupational stress; mental wellbeing; body mass index; diet; physical activity; musculoskeletal disorder; smoking; alcohol and drug use; shift work amongst offshore workers.

This narrative review has highlighted a lack of high quality and relevant research. There is a particular need to research workers' participation in self care activities and the resultant influence of domains on health and well being.

Introduction

The oil and gas industry is a vital contributor to the global economy and a key source of employment in oil-producing countries. Financial forecasts predict its continued economic influence; however, oil production is, in part, largely dependent on a core workforce who will commit themselves to a unique and somewhat arduous working lifestyle. Sustained working periods, allied to the intrinsic demands and hazards of offshore work, may place significant physical and psychological burden on workers, and consequently, would necessitate that workers are in good health over the course of their career.

As stipulated by Oil and Gas UK, it is mandatory that all offshore workers undertake a medical examination, conducted by a certified doctor, once every two years to maintain their certificate to work. In an effort to ensure health standards are upheld and to mitigate incidences of poor health, workers are required to satisfy the minimum criteria on a range of medical assessments: body mass index, vision, pulse and blood pressure, lung capacity and urinalysis [1]. Increasingly providers are utilising Functional Capacity Evaluations to assess physical fitness. Such measures seek to evaluate: strength; stamina; aerobic fitness; role-specific functional task simulation [2].

Well maintained health stands to benefit employee safety in addition to the broader personal gains achieved via improvement. Further, according to a report published by the International Association of Oil and Gas Producers [3], an unhealthy workforce will incur higher rates of absenteeism, and will increase the likelihood of emergency evacuation from an installation. The paper, A Recommended Fitness Standard for the Oil and Gas Industry [4], advises that improving the health and wellbeing of employees working within the offshore industry could be a critical determinant in ensuring economic opportunities are maximised and the longevity of the workforce.

Developing an understanding of the health and wellbeing of personnel working in offshore

environments is of significant interest. The aim of this narrative review is to synthesise the published literature on health and wellbeing in the offshore workforce.

Method

A narrative review is typically defined as an overview and synthesis of literature pertaining to a specific topic. Literature searches should be performed and documented, and it should be evidenced that high levels of methodological rigour have been applied [5]. Electronic searches were carried out using: The Cochrane Library, Cumulative Index to Nursing and Allied Health Literature, Medical Literature Analysis and Retrieval System Online, PsycArticles, and Web of Science databases. Key terms were separated by the Boolean Operator AND, and truncated, where appropriate, using the asterisk symbol (*). Key word searches included: offshore AND health*; offshore AND well* (to cover wellbeing and wellness).

All study designs (qualitative; quantitative; mixed methods; systematic reviews) were included in the review. In addition, the inclusion criteria specified that studies on offshore health and wellbeing were published: in the English language; between January 1994 and November 2014. Hand searching, to identify eligible articles which may not have been indexed using the key terms, was performed on the reference list of each article identified within the electronic search.

A total of 26 papers satisfied the inclusion criteria and included: two systematic reviews; 23 quantitative; one qualitative study. Articles were collated into a broader categories, based on their findings, and nine domains of health and wellbeing were identified: (i) occupational stress; (ii) mental wellbeing; (iii) body mass index; (iv) diet; (v) physical activity; (vi) musculoskeletal disorder; (vi) smoking; (viii) alcohol and drug use; (ix) shift work.

Results

Results are presented according to each of the health and wellbeing domains outlined in Table 1.

Table 1. Domains and definitions

Domain	Definition
Occupational stress	**"***the adverse reaction people have to excessive pressures or other types of demand placed on them at work***"** [6]
Mental health	"*a state of wellbeing in which every individual realises his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to her or his community*" [7]
Body mass index (BMI)	"*Body mass index (BMI) is a simple index of weight-for-height that is commonly used to classify overweight and obesity in adults. It is defined as a person's weight in kilograms divided by the square of his height in meters (kg/m^2)*" [8]
Diet	"*Specific recommendations for a healthy diet include: eating more fruit, vegetables, legumes, nuts and grains; cutting down on salt, sugar and fats. It is also advisable to choose unsaturated fats, instead of saturated fats and towards the elimination of trans-fatty acids*" [9]
Physical activity	"*Physical activity is defined as any bodily movement produced by skeletal muscles that requires energy expenditure*" [10]
Musculoskeletal disorder	"*The term MSD covers any injury, damage or disorder of the joints or other tissues in the upper/lower limbs or the back*" [11]
Smoking	*Not applicable*
Alcohol and drug use	*Not applicable*
Shift work	"*shift work can be defined as employment in any work schedule that is not a regular daytime schedule (that is, approximately 0900 to 1700)*" [12]

Occupational stress

Ten quantitative studies (Table 2) reported occupational/work related stress. Frequently induced via exposure to physical and psychosocial stressors, stress pertaining to the workplace is reportedly a key source of discontent among industry personnel. For example, Bjerkan [13] reports that offshore workers were significantly more likely to perceive their work environment as hazardous when compared with their onshore counterparts.

Sources of occupational stress in the offshore industry

Wong et al [14] applied the Chinese Occupational Stress Scale, to assess the nature of work-related stress in offshore workers. A number of stressors reported, the four most prominent relating to the physical environment, safety, the interface between job and family/social life, and career and achievement.

Factors associated with occupational stress and its impact on the offshore industry

Associations between experiences of occupational stress and a number of variables have been demonstrated: low social support; Type A personality (characterised by a competitive, urgent and hostile nature) [15]; musculoskeletal pain [16]; engagement in health behaviours [17]; poorer mental health [18].

Moreover, personnel who have sustained injuries whilst at work perceived a higher risk, reported greater dissatisfaction with safety, and experience pronounced overall occupational stress than those not injured in the workplace [19]. The findings in relation to risk were verified in another study demonstrating a significant association between near misses and higher levels of risk perception [20]. Occupational stress has been associated with greater job dissatisfaction and increased strain in the workplace. Further, workplace strain has been significantly related with an increased likelihood of absenteeism [21].

Table 2. Occupational stress in the offshore industry

Study	Aims/Objectives	Study design	Setting, participants (response rate)	Key findings
Bjerkan, A.M. (2011) (13)	To evaluate onshore and offshore employees perceptions of psychological and physical health.	Cross-sectional survey of Norwegian offshore workers and onshore employees working within the same organisation.	A purposive sample of on and offshore workers were mailed the questionnaire, n=414 (47.1%: onshore: n=290 70%; offshore: n=90 21.7%).	Offshore workers were significantly more likely than their onshore counterparts, to perceive their work environment as hazardous.
Chen, W.Q., et al. (2003) (15)	To identify the determinants of perceived occupational stress among Chinese offshore workers.	Cross-sectional survey, using the Occupational Stress Scale, of Chinese offshore workers within the same organisation.	A purposive sample of offshore workers returning from their offshore rotation completed the questionnaire, n=561 (96.6%).	Social support was associated with stress: lower perceived levels were associated with greater stress. Type A personalities experienced higher perceived occupational stress.
Chen, W.Q., Yu, I T-S., Wong, T.W. (2005) (16)	To determine the impact of occupational stress and psychosocial factors on musculoskeletal pain.	Cross-sectional survey, using the Occupational Stress Scale, of Chinese offshore workers within the same organisation.	A purposive sample of offshore workers returning from their offshore rotation completed the questionnaire, n=561 (96.6%).	56.3% of respondents reported multiple symptoms of musculoskeletal pain. Six sources of occupational stress were significantly associated with musculoskeletal pain.
Chen, W.Q., Wong, T.W., Yu, I T-S. (2008) (17)	To explore the relationship of occupational stress and social support with health-related behaviours.	Cross-sectional survey, using the Occupational Stress Scale, of Chinese offshore workers within the same organisation.	A purposive sample of offshore workers returning from their offshore rotation completed the questionnaire, n=561 (96.6%).	Association between aspects of occupational stress and engagement in risky health behaviours.

Table 2 (continued)				
Study	Aims/Objectives	Study design	Setting, participants (response rate)	Key findings
Chen, W.Q., Wong, T.W., Yu, I T-S. (2009) (18)	To explore the influence of occupational stress on mental health in offshore workers.	Cross-sectional survey, using the Occupational Stress Scale, of Chinese offshore workers within the same organisation.	A purposive sample of offshore workers returning from their offshore rotation completed the questionnaire, n=561 (96.6%).	Nine domains of occupational stress associated with mental health and accounting for 19.9% of the total variance: "interface between job and family/social life"; "career and achievement"; "safety"; "management problems and relationships with others at work"; "physical environment of the workplace"; "ergonomics"; "organisational structure".
Nielsen, M.B., Tvedt, S.D., Matthiesen, S.B. (2011) (20)	To determine the association between risk perception and positive psychological safety to job satisfaction.	Cross-sectional survey of Norwegian offshore workers.	A random sample of offshore employees were sent a questionnaire via post (no information on randomisation process), n=1017 (59%).	High levels of perceived risk are associated with near misses.
Rundmo, T. (1995) (19)	To assess the effect of injury on risk perception, job satisfaction and stress.	Cross-sectional survey of Norwegian offshore workers.	Questionnaire method and sampling strategy unknown, n=915 (92%).	Injured employees may perceive higher risk, dissatisfaction with safety and higher levels of occupational stress.
Ulleberg. P., Rundmo, T. (1997) (21)	To examine how job stress may affect workers' experience of strain.	Cross-sectional survey of Norwegian offshore workers.	Questionnaire distributed on-board installations using a purposive sampling technique, n=1137 (87%).	Job stress associated with job satisfaction and strain. Social support from supervisor mediated strain. Experience of workplace strain was significantly associated with employee absenteeism.
Wong. T.W. (2002) (14)	To explore the perceived sources of occupational stress.	Cross-sectional survey, using the Occupational Stress Scale, of Chinese offshore workers within the same organisation.	A purposive sample of offshore workers returning from their offshore rotation completed the questionnaire, n=561 (96.6%).	Five main stressors included: unpleasant working condition due to noise; feeling isolated from home and world events whilst offshore; awareness that safety of others may be compromised as a result of misjudgement; disruption to social life whilst working offshore; cannot play family roles while offshore.

Mental health

Three quantitative studies (Table 3) explored the prevalence and nature of poor mental health.

Exploring poor mental wellbeing in the offshore industry

Three studies explored the effects of individual and psychosocial work factors on mental distress. One reported an association between poor mental health and several domains of the Chinese Occupational Stress Scale [18]. In addition, further developments in the area note the association of reduced mental wellbeing with gender (male employees are more likely to experience mental distress than female personnel), increasing job demands, poor social support and lack of satisfaction with the home/work interface [22]. Similarly, in a longitudinal survey analysis of psychological distress, it was concluded that the strongest predictors of distress at follow-up were distress at baseline, exposure to bullying in the workplace and management by leaders who utilise a laissez-faire managerial approach (characterised by providing workers with full autonomy in decision making) [23].

Table 3. Mental Health in the offshore industry

Study	Aims/Objectives	Study design	Setting, participants (response rate)	Key findings
Chen, W., Wong, T.W., Yu, I. (2009) (18)	To explore the influence of occupational stress on mental health.	Cross-sectional survey of Chinese offshore workers working within the same organisation.	A purposive sample of offshore workers returning from their offshore rotation completed the questionnaire, n=561 (96.6%).	Poorer mental health associated with occupational stress and avoidant/negative behaviour coping styles.
Ljosa, C.H., Tyssen, R., Lau, B. (2011) (22)	To investigate the association between individual and psychosocial work factors and mental distress.	Cross-sectional survey of Norwegian offshore workers working within the same organisation.	A purposive sample of offshore workers were invited to complete a web-based questionnaire, n=1336 (56%).	High scores on quantitative demands, low scores on social support and high scores on shift work home-interface were all associated with mental distress.
Nielsen, M., Tvedt, S., Matthiesen, S. (2013) (23)	To investigate the prevalence of psychological distress and stressors in the work environment as prospective predictors of distress.	Longitudinal survey, administered at two time points 6 months apart, of Norwegian Continental Shelf workers.	A purposive sample was mailed the questionnaire. Baseline: n=1017 (59%); Follow-up: n=741 (72%).	8-9% suffered from psychological distress. Strongest predictors of psychological distress at follow-up were baseline distress, exposure to workplace bullying and laissez-faire leadership.

BMI

Four quantitative studies (Table 4) have been published and endeavoured to determine the prevalence of overweight and obese BMI profiles in the offshore population and the associated factors.

The body profile of offshore workers

Two longitudinal studies sought to evaluate trends in the weight and BMI of offshore workers in the UK have reported that the average weight has increased from 79.4kg to 87.6kg [24], and similarly, that BMI has significantly increased over the same seven year period [25]. Further, it has been reported, from two separate cross-sectional studies on health in the UK offshore workforce, that 52% of the sample was classified as overweight, and a further 12-15% categorised as obese. Consequently, the data are indicative that 64-67% of employees are of a weight which is out with the upper limits of a BMI within the normal range [26, 27].

Predictors of BMI

One study explored the association between BMI and other key health variables. Using longitudinal analysis, smoking was identified as the strongest predictor of BMI (cessation increased and starting, decreased BMI) [25]. In addition, it was reported that those with higher BMIs were more likely to be working in sedentary roles [27].

Table 4. Body mass index in the offshore industry

Study	Aims/Objectives	Study design	Setting, participants (response rate)	Key findings
Civil Aviation Authority. (2011) (24)	To compare the weight estimates of offshore workers from one time period to another.	Analysis of UK offshore workers' records.	Data not available.	Average weight of a male passenger had increased from 79.4kg to 87.6kg.
Mearns, K., Hope, L. (2005) (26)	To explore the health related practices of workers on offshore installations.	Cross-sectional survey of UK offshore workers. Questionnaire distributed by medics.	A purposive sample of workers completed the questionnaire whilst on the installation, n=1928 (57.2%).	64% respondents with a BMI classified as overweight (52%) or obese (12%).
Mearns, K., Hope, L., Reader, K. (2006) (27)	To explore health and wellbeing of offshore workers	Cross-sectional survey of UK offshore workers. Questionnaire distributed by medics.	A purposive sample of workers completed the questionnaire whilst on the installation, n=703 (35%).	67% respondents classified as overweight (52%) or obese (15%)
Parkes, K.R. (2003) (25)	To examine BMI of offshore workers in relation to known predictors.	Longitudinal survey research conducted in 1995 and 2002 amongst UK offshore workers.	A purposive sample of workers were recruited by researchers who were on-board the installation. Baseline: n=1598, 82.6%); follow-up: n=354 (34.9%).	Significant increase in BMI from 1995-2002. Proportions of increments were found to be no higher than population averages. BMI increased in those who stopped smoking and decreased in those who started. Smoking greatest predictor of BMI within the sample. Sedentary work associated with higher BMI, when all other factors were controlled.

Diet

Despite the current interest in intervening to stabilise or reduce the increasing BMI of offshore workers, there is only a small body of research, comprising three quantitative studies (Table 5), exploring the dietary choices of personnel.

Exploring diet in the offshore workforce

Findings from three studies indicate that, amongst workers operating in the UK Continental Shelf (UKCS) that self-reported diet was unhealthy [26,27,28] with under one third report eating healthily each day [27].

Table 5. Diet in the offshore industry

Study	Aims/Objectives	Study design	Setting, participants (response rate)	Key findings
Horsley, H. (1996) (28)	To explore the prevalence of risk factors for coronary heart disease amongst offshore workers.	Cross-sectional survey completed during offshore survival training conducted in the North East of Scotland.	A purposive sample of workers completed the questionnaire whilst in attendance at offshore survival training, n=507 (93%).	Significant differences in diet on and offshore: healthier onshore.
Mearns, K., Hope, L. (2005) (26)	To explore the health practices of offshore workers.	Cross-sectional survey of UK offshore workers. Questionnaire distributed by medics.	A purposive sample of workers completed the questionnaire whilst on the installation, n=1928 (57.2%).	Offshore diet was perceived to be less healthy (23% classified their diet as unhealthy or not very healthy) than onshore (8% classified their diet as unhealthy or not very healthy).
Mearns, K., Hope, L., Reader, K. 006) (27)	To explore health and wellbeing of offshore workers.	Cross-sectional survey of UK offshore workers. Questionnaire distributed by medics.	A purposive sample of workers completed the questionnaire whilst on the installation, n=703 (35%).	Only 29% respondents reported healthy eating habits everyday on the installation

Physical activity

Three quantitative studies and one qualitative report (Table 6) exploring physical activity have been published. Research by Bell et al [29] outlined the combined effect of reduced physical activity and long periods of sitting on increasing the incidence of obesity. Accordingly, determining the degree to which offshore personnel engage in physical activity is pertinent to any evaluation of the health of the workforce.

Physical activity in the offshore workforce

Three quantitative studies exploring the prevalence of physical activity in the offshore workforce published results on engagement. Only 27% of workers were reported to undertake physical exercise three or more times per week when offshore. Further, findings indicate that personnel are more likely to engage in physical activity when onshore [26,28]. For example, Mearns and Hope [26] report that 50% respondents engage in light to moderate physical activity when offshore compared with 69% exercising to the same degree onshore.

Barriers to physical activity in the offshore workforce

Barriers to physical activity amongst offshore personnel have been explored using both quantitative and qualitative methods. One quantitative study reported that the majority of workers who completed a questionnaire on barriers were either too tired after work (43%) or disliked working out in gyms (25%) [27]. Further, in a series of interviews with participants working offshore, it was recounted that there is a sense of inequality on-board installations between operating and contracting employees. The author noted that company, or operator employees are granted exclusive access of the gym outwith core working hours, whilst contracting personnel are not. In addition, one of the female respondents discussed her initial reluctance to visit the gym on-board the instillation due to the perception that it was a masculine domain. The restrictions with regard to employment status and perceived gendered environments may serve as a barrier to the use of recreational facilities and as a means to reinforce inequality within the population [30].

Table 6. Physical activity in the offshore industry

Study	Aims/Objectives	Study design	Setting, participants (response rate)	Key findings
Collinson, D. (1998) (30)	To explore the power relations and inequalities inherent within the offshore industry.	Semi-structured interviews with offshore personnel.	Participants were purposively selected based on their occupation and were invited to participate, all interviews were conducted on the offshore installation recruitment site, n=85.	Inequality between contractors and operators. Gendered physical activity environments affect participation.
Horsley, H. (1996) (28)	To explore the prevalence of risk factors for coronary heart disease.	Cross-sectional survey completed during offshore survival training conducted in the North East of Scotland.	A purposive sample of workers completed the questionnaire whilst in attendance at offshore survival training, n=507 (93%).	41% and 49% respondents exercised regularly offshore and: onshore respectively.
Mearns, K., Hope, L. (2005) (26)	To explore the health practices of offshore workers.	Cross-sectional survey of UK offshore workers.	A purposive sample of workers completed the survey whilst on the installation, n=1928 (57.2%).	Respondents were less likely to participate in low to moderate physical activity offshore (50%) than when onshore (69%). 43% of those who stated they did no or very little exercise when offshore were too tired after work. A further 25% disliked using gyms.
Mearns, K., Hope, L., Reader, K. (2006) (27)	To explore health and wellbeing.	Cross-sectional survey of UK offshore workers. Questionnaire distributed by medics.	A purposive sample of workers completed the questionnaire whilst on the installation, n=703 (35%).	27% respondents exercised 3x p/w; 18% rarely, 20% occasionally and 10% never used the gym when on-board an installation.

Musculoskeletal disorder

Two studies (Table 7) on the prevalence and causes of musculoskeletal disorder in offshore workers have been published. The Health and Safety Executive, a UK regulatory body, cite back pain and musculoskeletal disorder as a major cause of work related absence [31]. The prevalence of such has significant implications for labour intensive workplaces and particularly for the offshore industry since musculoskeletal disorder is one of the main causes of medical evacuation [32].

Exploring musculoskeletal disorder in the offshore industry

Thirty six percent of offshore workers report experiencing muscular pain, of which 67% believe this has been aggravated by their work offshore [27]. A retrospective analysis of health records is indicative that the majority of reported disorders related to the upper limbs (53%) and back (20%). In addition, 40% of cases had been filed by maintenance workers [33].

Table 7 Musculoskeletal disorder in the offshore industry

Study	Aims/Objectives	Study design	Setting, participants (response rate)	Key findings
Mearns, K., Hope, L., Reader, K. (2006) (27)	To explore health and wellbeing of offshore workers.	Cross-sectional survey of UK offshore workers. Questionnaire distributed by medics.	A purposive sample of workers completed the questionnaire whilst on the installation, n=703 (35%).	36% respondents reported muscular pain, and noted that this was aggravated by their work offshore (67%),
Morken, T., Mehlum, I.S., Moen, B.E. (2007) (33)	To analyse the number of reported work-related musculoskeletal disorders and risk factors amongst offshore workers.	Retrospective analysis of a registry of work-related diseases offshore from 1992 to 2003 obtained from the Petroleum Safety Authority.	3131 new cases of musculoskeletal disorders (6725 cases in total reported)	Majority were disorders of the upper limbs (53%); back pain (20%); neck disorders (8%); disorders of the lower limbs (16%): knee injuries 12%). 40% of cases were reported by maintenance workers. 38% perceived to be caused by a high physical workload.

Smoking

Three quantitative studies (Table 8) have been published which report on the prevalence of smoking within the offshore workforce. According to the World Health Organisation [34], smoking tobacco is a major cause of premature mortality. Increasing wellness with regard to smoking stands to benefit the individual and employers.

The prevalence of smoking in the offshore workforce

The prevalence of smoking amongst offshore workers, according to the published data of multiple large scale studies, is typically higher than population averages that have been taken at the time[26,28]. The most recent data from the UKCS indicate that around one third smoke (31-32%) and a further quarter classified as ex-smokers (24-27%)[26,27]. The figure is less than what has been previously reported [28] and is indicative of a decreasing trend in the prevalence of smoking within the offshore workforce.

Table 8. Smoking in the offshore industry

Study	Aims/Objectives	Study design	Setting, participants (response rate)	Key findings
Horsley, H. (1996) (28)	To explore the prevalence of risk factors for coronary heart disease amongst offshore workers.	Cross-sectional survey completed during offshore survival training conducted in the North East of Scotland.	A purposive sample of workers completed the questionnaire whilst in attendance at offshore survival training, n=507 (93%).	37.2% were classified as smokers. Significant decrease in frequency of smoking whilst onshore.
Mearns, K., Hope, L. (2005) (26)	To explore the health practices of offshore workers.	Cross-sectional survey of UK offshore workers. Questionnaire distributed by medics.	A purposive sample of workers completed the questionnaire whilst on the installation, n=1928 (57.2%).	32% respondents were smokers; 27% previously smoked.
Mearns, K., Hope, L., Reader, K. (2006) (27)	To explore health and wellbeing of offshore workers.	Cross-sectional survey of UK offshore workers. Questionnaire distributed by medics.	A purposive sample of workers completed the questionnaire whilst on the installation, n=703 (35%).	31% were classified as smokers.

Alcohol and drug Use

Typically offshore installations operate a zero-tolerance policy on alcohol and drug abuse, whereby employees are subject to random testing at heliports [2]. Regular testing, does not however, preclude engagement in risky behaviours onshore. Three studies have focussed on alcohol use within the industry (Table 9).

The prevalence of alcohol and drug use within the offshore workforce

The most recent data on alcohol use in offshore workers indicated that around one third (32%) consumed alcohol either 5-6 days per week (17%), or everyday (15%) when onshore [26]. A qualitative interview study outlined a pattern of alcohol use which is congruent with the opportunity to over-indulge viewpoint, and notes that offshore workers had described heavy onshore alcohol use as a release, and method of expressing freedom [30].

Table 9. Alcohol and drug use in the offshore industry

Study	Aims/Objectives	Study design	Setting, participants (response rate)	Key findings
Collinson, D. (1998) (30)	To explore the power relations and inequalities of the offshore industry.	Semi-structured interviews conducted on-board with contract workers.	Participants were purposively selected based on their occupation and were invited to participate, all interviews were conducted on the offshore installation recruitment site, n=85.	Alcohol used to express a sense of freedom and as release.
Horsley, H. (1996) (28)	To explore the prevalence of risk factors for coronary heart disease in offshore workers.	Cross-sectional survey completed during offshore survival training conducted in the North East of Scotland.	A purposive sample of workers completed the questionnaire whilst in attendance at offshore survival training, n=507 (93%).	32% respondentsreported consuming more than 21 units per week, which was higher than the national average at the time.
Mearns, K., Hope, L. (2005) (26)	To explore the health practices of offshore workers.	Cross-sectional survey of UK offshore workers. Questionnaire distributed by medics.	A purposive sample of workers completed the questionnaire whilst on the installation, n=1928 (57.2%).	32% reported consuming alcohol on either 5-6 days a week or ever day when on shore leave.

Shift work

Perhaps one of the most extensively researched areas within the field of offshore health relates to shift work. Five studies in total have been published on exploring the effects of shift work within the offshore industry and include: two systematic reviews; three quantitative studies (Table 10).

Shift work and health

Evidence suggests that shift work disrupts the normal circadian system and has subsequent effects on: reducing sleep quality; impairing alertness; decreasing performance. Further, offshore night shift work is associated with poorer sleep quality, gastric issues, increased risk of injury and reduced mental wellbeing [35]. In contrast, however, Fossum et al [37] report no association between shift work and poor mental health.

Table 10. Shift work in the offshore industry

Study	Aims/Objectives	Study design	Setting, participants (response rate)	Key findings
Fossum, I., Bjorvatn, B., Waage, S., Pallesen, S. (2013) (36)	To examine effects of shift and night work in the offshore industry amongst offshore workers.	Systematic review of offshore shift work studies.	29 papers were included in the review.	Poorer sleep quality in offshore nightshift workers. No results from the offshore environment which associate shift work with poorer mental wellbeing, increased BMI or a negative impact on family/social life.
Parkes, K. (2012) (35)	To examine offshore day/night shift patterns in relation to operational safety and individual health risks amongst offshore workers.	Systematic review of offshore shift work studies.	24 papers were included in the review.	Survey: Shift pattern (night work) related to gastric issues, poorer mental health and impaired sleep quality. Field: association between circadian desynchrony and reduced sleep quality, alertness and impaired performance. Official data: Shift work, of day/night nature, linked with higher rates of injury. Re-adaptation from night to day shift typically takes longer than adaptation to night shift, and interventions which have endeavoured to assist with re-adaptation have not demonstrated success to a high level.
Waage, S., et al. (2009) (37)	To examine shift work disorder (SWD) in North Sea offshore workers.	Cross-sectional survey study of Norwegian Continental Shelf Workers.	Workers were recruited whilst on the installation, n=204 (78.8%): 103 were working swing shift and were included in the study.	23.3% met criteria for shift work disorder: characterised by insomnia during sleep cycle (day in the case of night workers). Those with SWD more likely to report subjective health complaints; pseudoneurological; gastrointestinal. Those with SWD demonstrated lower coping scores.
Waage, S., et al. (2012) (38)	To examine sleepiness in three different shift work schedules amongst offshore workers.	Before and after (within-subjects) study of offshore workers working a swing shift, day or night shift rotation.	Objective and subjective measurements were taken on installation, n=28 (87.5%).	Subjective sleepiness higher initially in night shift workers. Higher levels of self-reported sleepiness after night shift when returning home. No differences in objective measures when offshore.
Waage, S., et al. (2013) (39)	To compare subjective sleep and subjective health complaints in offshore workers.	Longitudinal study of Norwegian offshore employees who completed a survey (pre and post rotation).	Workers were sampled onshore, n=188 (72.6).	Those working a swing shift were significantly ($p<0.005$) more likely to report symptoms of insomnia than shift workers.

Shift work, sleep and health

Additional research has focussed on the effects of shift work disorder (characterised by a significant sleep disturbance). An incidence of 23.3% has been observed within offshore personnel and it has been demonstrated that those with shift work disorder were more likely to report subjective health complaints, pseudo-neurological issues and gastric problems. In addition, workers who met the criteria for diagnosis demonstrated lower coping scores and poorer sleep quality [37].

Whilst there is evidence that offshore shift work rotations may induce an array of negative health outcomes, there are conclusions which suggest that the nature of the shift schedule has little effect on

wellbeing. For example, in a study of personnel working three different shift schedules no differences in reaction time tests were observed. However, night shift workers were significantly more likely to experience tiredness than those returning from working day or swing shift rotations [38]. The study of health outcomes in relation to offshore shift work has also been extended to determine sleep quality before and after a two week work schedule. A reduction in sleep quality and insomnia across the work period was observed. Personnel on a swing shift rotation were significantly more likely to report experiencing symptoms of insomnia than day shift workers [39].

Discussion

This narrative review has provided a synthesis of the research literature on the health of offshore workers from an international perspective. The results of the review suggest that, within the offshore workforce, there are multiple key areas which are worth considering for future research. Further, the analysis has demonstrated that there are areas in which there is a paucity of literature. For example, drug use has not been explored within the population and there are a number of domains for which the data is particularly dated. The last study to publish data on BMI, smoking, alcohol use, physical activity and diet was conducted almost a decade ago [27]. Changes in offshore population demographics and health, such as an increase in female employment and reported rise in BMI, mean that research conducted at regular intervals is important.

Further, whilst there is a body of literature dedicated to exploring the presence of poor mental health within the industry, exploration of mental wellbeing is largely ignored. Mental wellbeing encompasses a broader perspective and has been defined as: *"a dynamic state in which the individual is able to develop their potential, work productively and creatively, build strong and positive relationships with others and contribute to their community. It is enhanced when an individual is able to fulfil their personal and social goals and achieve a sense of purpose in society"* [40]. It is believed to be an important concept since positive mental wellbeing is not necessarily the resultant of a mere absence of poor mental health. Consequently, mental wellbeing within the offshore industry remains unexplored and is deserving of a focus within future work.

In an effort to ensure accuracy of findings, it is recommended that researchers include, where possible, validated measures within study designs. It is apparent that a number of studies included within this review did not utilise validated tools to assess either physical activity or diet. Whilst there may have been a number of difficulties in employing use of such, doing so enables comparisons to be made with population averages both within and out-with the offshore workforce. Validated measures ensure robustness in data collection particularly where domains need to be well-defined, such as physical activity, which is particularly vulnerable to subjective interpretation.

Further, Mearns and Hope [26] and Horsley [28] utilised measures of alcohol consumption which do not permit the data attained to be compared with current government guidelines. The Department of Health's [41] most recent guidance stipulates that harmful drinking is defined by both the frequency of use and the number of units consumed per day. Consequently, the aforementioned either generated data on weekly alcohol consumption in units [28] or the weekly frequency of use [26].

While the literature on offshore health does provide a broad overview of key issues within the industry, there are key limitations within the current evidence base. A number of studies have focussed on workers operating from a specific geographical location, for example the Norwegian Continental Shelf, and whilst these are helpful in exploring the health and lifestyle of the workforce, they lack generalisability or transferability to other settings due to variation in cultural norms and working patterns. To illustrate, alcohol use within the UK population is a key public health issue, however other cultures, are not affected to the same extent. Consequently, any health evaluations may only be applicable to the population that has been sampled, meaning that there are key developments to be made across a variety of health domains within sector-specific offshore workforces.

Moreover, the literature synthesised within this review has primarily utilised quantitative methods, and

which may be restrictive in terms of exploring health from the individual perspective. The current data have demonstrated a number of associations between variables and has provided some evidence that there may be cause for concern on some health issues, however the reasons as to why are relatively unknown. For example, poor diet has been identified as a health issue and it has been established that offshore eating patterns, and choices, are healthier when workers are onshore. There is however, little in the way of exploring the factors that affect these choices from the worker's perspective. Accordingly, future research should utilise mixed-methods or qualitative techniques, such as interviews or focus groups, to enhance the current findings.

The majority of studies are cross-sectional, using survey methods to gather data, and although this may be a criticism, due to issues with the generalisability of data, the transient nature and wide geographical spread of worksites mean that alternative methods of data collection could prove problematic for researchers. Finally, most of the aforementioned research comprised male dominant samples. Although fewer females work within the offshore industry, their numbers are increasing. Hence, future research would benefit from ensuring a female perspective since it may differ from a male viewpoint, particularly when evaluating health and lifestyle.

Future Research

As evidenced by the outcomes of this narrative review, there is a need for further research within the health of the offshore workforce. Whilst previous work does provide a body of evidence on multiple aspects of health and wellbeing, and as such may prove as a useful comparator, there are key elements which require revisiting due to the significant time lapse since the last publication. In particular, future work should seek to provide an overview of health and wellbeing within the industry.

In light of these recommendations and in an effort to guide future developments in offshore health, the authors of this paper have begun collecting health and wellbeing data on a large sample of offshore workers with the aim to conduct interviews to explore pertinent themes. It is hoped that this mixed methods approach will enable an evidence-base on the health and lifestyle needs of offshore workers to be established, and which will be used to inform future developments which focus on increasing engagement in self care within the population.

Limitations

Whilst the narrative review has endeavoured to synthesise the literature in a structured manner, there are some limitations of the methods utilised. For example, only studies published in English were included in the review and this may have limited the scope. Further, and although attempts were made to include grey literature, due to issues in searching for unpublished sources, there may be a number of studies which have been unintentionally excluded from the review. In an effort to overcome selection bias, which is often an inherent feature in narrative reviews; a structured search strategy was established prior to searching for sources.

Conclusions

The narrative review of the literature provides an overview of the health and lifestyle of offshore workers, covering health domains such as: occupational stress; mental wellbeing; body mass index; diet; physical activity; musculoskeletal disorder; smoking; alcohol and drug use; and shift work. However the methods utilised and limitations with regard to transferability of findings mean that the current data may not be an accurate representation of the current offshore workforce. Further, research studies which take the current limitations into account and employ a mixed-methods approach are needed.

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Gibson Smith K, Paudyal V, Stewart D, Klein S
Robert Gordon University, Aberdeen, UK

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Correspondence:

Dr Vibhu Paudyal
School of Pharmacy and Life Sciences, Robert Gordon University
Riverside East, Garthdee Road, Aberdeen
AB10 7GJ, UK
Phone +44 (0)1224 262595 Fax +44 (0)1224 262555
Email: v.paudyal1@rgu.ac.uk

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Responding to Multiple Casualties in Remote Industrial Locations

- a Discussion Document

Colin Smart Bsc
Senior Partner, TSG Associates
colin@smartmci.com

Bob Mark MB BS FIMC RCSEd
Medical Advisor, TSG Associates
drbobmark@smartmci.com

Introduction

In this paper we will explore the response to multiple casualty incidents (MCI's) in remote industrial settings, particularly with regard to the oil and gas industry.

The authors will draw on existing guidance, best practice and our considerable combined hands-on experience of pre-hospital, military and remote area industrial medical care and emergency planning.

We will review the definitions of multiple and mass casualty incidents; the overall aims of the response; the particular challenges and opportunities that prevail in remote industrial settings; current guidelines within and outside the industry in order to highlight the significant gaps in the industry's guidelines and preparedness for such events compared to current practice in conventional medical systems; issues of duty of care and liability and the human element of responding to an MCI.

We will make proposals for discussion regarding best practice guidelines for planning, initial reporting from the scene, primary triage and immediately necessary lifesaving treatment, secondary triage, paediatric triage, communication pathways and specific competencies and equipment scales.

Background

Definitions

A multiple casualty incident (MCI) is, obviously and simply, an incident causing more than one casualty. An MCI may, due to numbers and/or severity of casualties, overwhelm, or threaten to overwhelm, the available medical resources. This situation is sometimes called a mass casualty incident.

Such events are usually due to physical trauma but can be associated with “medical” causes such as infectious disease.

“Remote” refers to locations where the medical evacuation of an ill or injured person to a hospital cannot be guaranteed to be achieved within four hours in foreseeable circumstances[1].

The aim of an MCI response

The aim of any response to an MCI is to minimise mortality and morbidity by maximising the efficiency of available resources.

We believe that success in achieving this deceptively simple aim is ultimately dependent on the existence and use of appropriate best practice guidelines. Such guidelines exist in the conventional and military environments, but it remains to be seen whether the oil and gas industry can match

these.

MCI's in remote industrial locations

Multiple casualties in conventional and military environments are a relatively frequent occurrence and, because of the capacity built into the relevant medical systems, rarely outstrip the available resources. However, in remote industrial locations very low numbers of casualties, especially if severely injured, have the potential to overwhelm the limited immediately available medical resources leading to potentially avoidable morbidity and mortality.

It is crucial to note that we are not considering here solely catastrophic events such as the Piper Alpha or Deepwater Horizon disasters, but events producing only a handful of patients. In remote areas a multiple casualty incident, or even mass casualty incident, can simply be more than one seriously injured person. The reasons for this are summarised in Box 1.

Box 1: Factors potentially exacerbating MCI's in remote industrial locations

Limited numbers of trained medical personnel on-site: often a single "medic".

Infrequent opportunities for the medic to manage severely injured patients leading to skill decay.

The pressure on the medic to perform several roles primary and secondary triage, treating patients, managing First-aiders, liaising with on-site management including providing information on casualties, liaising with the "topside" doctor*, input into organising evacuation of the casualties, preparing casualties for evacuation.

Limited availability of medical investigations and treatment on-site.

Geographical isolation, environmental conditions and security situation leading to delays in providing on-site medical care.

Geographical isolation, environmental conditions and security situation causing delays in providing, or prolonging, evacuation of the patients to definitive care.

* also known as "reach-back" or "on-line medical control"

Despite the extra difficulties in managing a MCI associated with remote industrial locations, this situation also affords some benefits and opportunities as outlined in Box 2.

Box 2: Opportunities associated with MCI's in remote industrial locations

Close-knit team of medical and non-medical personnel who work together on a daily basis.

Non-medical personnel who can be trained in primary triage.

Non-medical personnel who can be trained to support the medic.

Communications likely to be used and tested daily.

Opportunities to exercise and test plans.

Personnel likely to have intimate knowledge of the geography of the location.

Understanding the human element of response

In many MCI's the responders will have limited experience of such events and will be subjected to numerous pressures faced with a casualty load heavier than their resources. An excellent example of an individual's response to an MCI was noted by one of the authors whilst teaching in the USA. One of his students had been involved in responding to both military and civilian incidents, as well as having been a casualty in an MCI himself. He described his thoughts and feelings about the initial

response as below;

"We have to remember that when dealing with an MCI, we are sending the least experienced people to perform the duties of triage and treatment in the first few minutes. With the adrenaline that is released as the rescuers go into the scene, triage has to be something that can overcome the tunnel vision and loss of fine motor skills and tunnel vision that is common with an adrenaline release" [2].

We need to keep this human element firmly at the forefront of our minds when planning and training for MCI's.

Do MCI's actually happen in remote industrial locations?

Despite the rigorous health, safety and environment regimes prevalent in industry the potential for MCI's persists and they still occur.

In addition to headline catastrophes less publicised incidents and near-misses persist [3,4,5].

Causes of such incidents unsurprisingly include motor vehicle collisions and other transportation events, fires, interpersonal violence including terrorism, environmental hazards, and toxic releases.

Even in the developed world increases in deaths in the oil and gas industry have been reported [6]. However, pushing the geographical boundaries of exploration and production can only increase both the hazards we face and the complexity of responding to incidents. For instance, motor vehicle collisions (MVC's) remain a global problem and there has been no recent fall in deaths worldwide [7]. Furthermore, the probability of dying following an MVC is higher in the undeveloped world, where many remote industrial projects are located, compared to the developed world with its more advanced medical systems.

War and terrorism are increasingly affecting the industry with the In Amenas attack being the most obvious example [8].

MCI's can, of course, affect not just industry employees but the local population as well, and personnel may be called to respond on a humanitarian basis to incidents such as MVC's or fires, including pipeline fires which can cause hundreds of casualties.

Duty of care and liability

Companies operating in remote locations have a duty of care to their employees and others working on their sites [9, 10].

The gap, which we will describe below, in medical planning and preparation for MCI's compared to conventional and military operations, leaves companies particularly exposed. Following a multiple casualty incident, should survivors or relatives consider that arrangements were inadequate and thereby caused avoidable morbidity or mortality, litigation is almost inevitable. In addition, the authors are acutely aware from our own experiences, and the experience of others, that responding to an MCI is psychologically stressful and the absence of appropriate planning and preparation can exacerbate that stress.

As has been seen by our colleagues in the security sector, the fact that loss of life has occurred in a far-off land is no bar to multi-million dollar law suits by bereaved relatives if they believe that proper measures have not been put in place [11].

MCI best practice guidelines outside the oil and gas industry

There is a continual effort in first world countries to provide highly effective systems to support the planning and preparation for, and response to, MCI's. The examples below show the high level of planning and preparation against which industry planning can be compared.

In the UK the civilian lead is the National Ambulance Resilience Unit (NARU). Their comprehensive strategic guidance documents and activities aim to ensure that each ambulance service in the UK has a unified and consistent MCI response. The NARU Major Incident Initial Action Cards [12], for instance, set this out in detail and provide extensive coverage of action cards, scene reports, forms, terminology, and triage methods.

The Advanced Life Support Group's Major Incident Medical Management and Support courses, covers the management of major incidents, including MCIs, at scene and their hospital and chemical, biological, radiation and nuclear versions, are widely taught and set standards for planning, response and training [13].

In the USA the Federal Interagency Committee for Emergency Medical Services (FICEMS) has published the 'National Implementation of the Model Uniform Core Criteria for Mass Casualty Incident Triage'. This document gives strategic guidance for a standard system of primary triage throughout the USA [14].

Also in the USA the National Disaster Life Support Foundation, Inc. "oversees the National Disaster Life Support courses, a series of educational programmes to better prepare health care professionals and emergency response personnel for mass casualty events."

In the conventional civilian environment, as well as National guidance on MCI's, local, detailed, planning and preparation by ambulance services and hospitals specifically for MCI's is routine.

In the British Army one in four soldiers are trained as "team medics". They have additional training in primary triage and have suitable equipment for this.

The overriding drive of all these standards and guidance is to provide organisations and individuals who may have limited experience of responding to MCI's framework to employ a plan or skill within their local environment. The structures and guidelines focus on:

- Risk assessment
- Planning and preparation for responding to MCI's
- Set actions for key personnel responding to the incident
- Standardised scene reports with terminology people can understand and therefore use to make decisions
- Standardised primary and secondary triage methods
- Consistent levels of equipment embedded throughout their systems appropriate to role

MCI best practice guidelines in the oil and gas industry

In contrast to the level of standards and guidance outside the oil and gas industry described above, the industry guidelines on MCI's that we have been able to find tends to be outdated and sparse. Our relevant findings are outlined below, not for the purpose of negative criticism, but to highlight the lack of adequate guidelines in the industry relative to the civilian and military benchmarks against which they might be judged.

In the UK Health and Safety Executive document *"Offshore medic training and qualifications for the purposes of The Offshore Installations and Pipeline Works (First-Aid) Regulations 1989 a guide for training organisations"* the relevant entries are limited to:

In Appendix 1: Roles and responsibilities of offshore medics: “to understand their role in emergency plans and to co-operate with the duty holder and others involved in implementing the plans”

In Appendix 2: Roles and responsibilities of offshore first-aiders: “The main responsibilities of the offshore first-aider are as follows: ...to assist in the management of serious incidents involving multiple casualties...”

In the UK *“Health care and first aid on Offshore installations and pipeline works Offshore Installations and Pipeline Works (First-Aid) Regulations 1989 Approved Code of Practice and guidance”* the sole relevant entries are:

In Appendix 1: Assessment of first-aid and basic healthcare needs:
“...additional facilities required for handling multiple casualties according to the emergency plan.....”

In Appendix 3: Roles and responsibilities of offshore first-aiders:
”...to assist in the management of serious incidents involving multiple casualties...”

In the UK Industry guidelines for first aid and medical equipment on offshore installations December 2000 the sole relevant reference is in under “Reference Material”, along with text books and fluid balance sheets, and is to the number of triage cards required for differing levels of Persons on Board. There are no recommendations for the required characteristics of these triage cards.

In the Oil and Gas UK Guidelines for the Management and Training in Emergency Response for Offshore Installations February 2010, medical roles are specifically excluded.

In the OGP-IPIECA document “Managing field operations in oil and gas activities, a guide for managers and supervisors in the oil and gas industry 2011”, whilst there are considerably more detailed guidelines on medical emergency response planning than in the above documents, the references to multiple casualty response are:

In Medical emergency management:
“To manage medical emergencies, each location should develop a site-specific medical emergency response plan (MERP), taking into account the potential for individual and multiple casualties.....”

In Drills, review and revision:
Drills: …..”The extent of resource deployment during drills should be predetermined by management and company-designated health- care professionals. This should include scenario planning, as well as simulated events addressing triage for multiple cases, followed by a thorough debriefing.”

The 2013 Institute of Remote Health Care document “Remote Healthcare for Energy and associated Maritime activities” echoes the OGP-IPIECA guidelines above, stating “the MERP (medical emergency response plan) needs to take into account the potential for individual and multiple casualties, describing the response to various medical emergency scenarios based on the health risk assessment, and utilizing available resources”. However this document takes things further. Under the training requirement for designated First-aiders a need for awareness of triage and multiple casualty situations is mentioned. In addition, it recommends that on-site health professionals should be skilled in triage. As with the OGP-IPIECA document further general guidance on medical emergency response planning is included in the document but not specifically for MCI’s. A “triage tent” is listed as a requirement, but no other equipment relevant to the management of MCI’s is mentioned.

Proposals for Discussion

We suggest that the industry needs best practice guidelines in the field of MCI response, particularly regarding planning, initial reporting from the scene, primary triage and immediate lifesaving treatment, secondary triage, communication pathways, specific competencies and equipment.

Planning

All organisations have their own approach to planning for emergencies including MERP's. We recommend that all MERP's include specific planning for multiple casualties which should include the following:

Command

A comprehensive, written, emergency plan, based on a local risk assessment, with action cards for all personnel/roles are essential parts of the command system. This may include the provision of a Medical Incident Officer to take overall command of medical issues if such a person can be deployed e.g. from shore-side for an offshore incident.

There must be a command structure for both the incident response as a whole and the medical response itself.

All personnel must be familiar with the role or roles they will be expected to play and be appropriately trained and equipped.

On most projects, due to the small number of medical professionals available, command roles will have to be fluid and the medical professional will have to prioritise their own activities.

In the case of large projects with hundreds or thousands of personnel it may be necessary and possible to set up a traditional Gold, Silver and Bronze command structure [15].

A crucial part of the command function is a system that can be used to record and update both the number, type and triage category of the casualties overall as well as an overview of each patient together with their current location and intended destination.

Safety

The response must be as safe as possible and the 1-2-3 principle of safety must be followed i.e., the safety priorities for rescuers are self, then scene, then survivors.

Safety will depend on a continuing risk assessment, control or avoidance of hazards, use of appropriate PPE, restricting access to the site etc.

Communication

Failure to communicate in general and the failure of actual telecommunications are the commonest problems identified in the aftermath of a major incident.

Call signs, radio frequencies and telephone numbers that might be used in a major incident must be collated and made available to all who might need them. This information must be regularly checked and updated and kept with each copy of the plan. Appropriate call signs and telephone numbers should be recorded on individual action cards together with the correct radio frequencies.

Personnel must be familiar with the operation of radios and telephones. The radios and telephones themselves must be checked and confirmed to be working and charged at appropriate regular intervals. Technical problems with communications, or even failures, can be expected. Communication with in-country and International offices, especially regarding the condition and evacuation of casualties, is labour-intensive and must be planned and managed.

Communication pathways themselves are discussed in more detail below.

Assessment

The number, type and severity of casualties must be assessed initially and at intervals during the incident.

Similarly risks must be assessed throughout the incident.

Responses must be adapted on the basis of these assessments.

Triage

This is the prioritisation of casualties, initially for treatment and later for evacuation as well. The condition of casualties will change, as may the care available, so triage must be dynamic. Triage is covered in more detail below.

Treatment

Initial treatment may have to be restricted to immediately necessary lifesaving first aid administered by the triage team (see below). Subsequently treatment will be carried out along conventional lines, albeit prioritised as per dynamic triage.

It may be necessary in advance to designate a “casualty clearing area” in addition to the “sick bay”, where patients can also be treated.

Advanced care will be carried out by medical professionals on site, during transport to the casualty clearing station, in the casualty clearing station and during evacuation.

Transport

Means of transporting casualties from the site of the incident to the casualty clearing station must be planned and practised in advance, e.g., in addition to ground ambulances adapting vehicles to carry recumbent casualties by removing seats.

The use of helicopters and fixed-wing aircraft requires much advanced planning. Medical personnel responsible for the MERP must liaise closely with the project’s aviation contractors to ensure that appropriate air support can be provided quickly and safely. It must be agreed beforehand what types and numbers of casualties can be carried. Landing sites and destinations must be agreed in advance. The continuing transport and care of patients once they reach the destination landing site or airport must be planned.

It is equally important to determine the conditions or situations in which flights will not be provided e.g., night time.

Aftermath

After the incident response has been stood down rescuers must be given the opportunity to “unload” and rested. Facilities must be cleaned and equipment re-stocked.

Debriefing should be carried out to review any lessons learned regarding what went well and what might be done better in the future.

Initial reporting from the scene

During the London Bombing on July 7th 2005 each ambulance crew arriving first at each location bombed used the same structure of scene report when providing initial reports. This allowed control rooms to assess the information in a structured manner and allocate additional resources based on

the key information being received. The uniform nature of each report made it easier and faster to make critical decisions, ultimately reducing the time from injury to definitive care for the casualties. It can only be speculated how difficult this job would have been had each crew been provided information on a non-structured basis.

There are numerous structured scene reports in use but the "ETHANE" format has been used for many years in UK civilian and military operations and works well under the pressures of a multiple casualty incident.

We recommend that this, or a similar format, is adopted for initial reporting from the scene in remote industrial areas:

E.T.H.A.N.E.

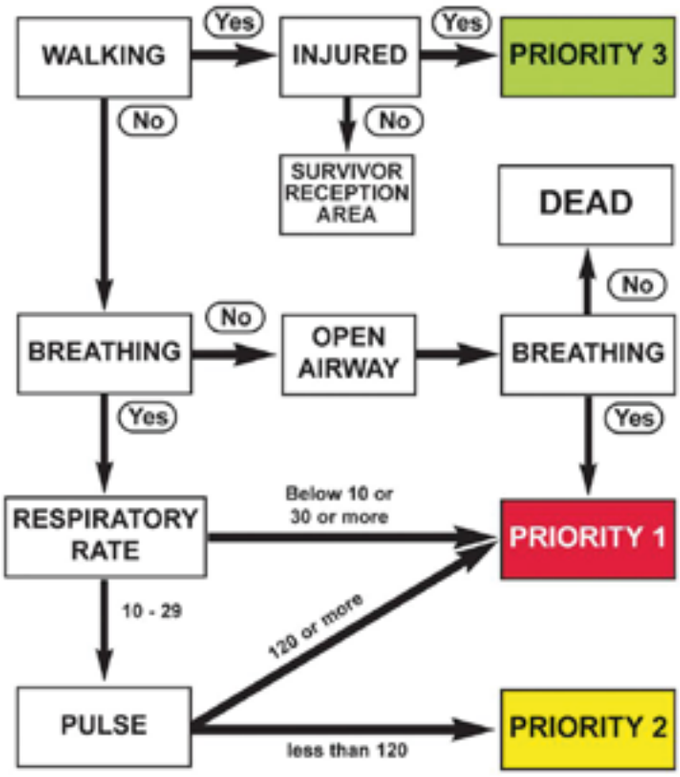
E Exact Location
T Type of Incident
H Hazards – present and potential
A Access and Egress
N Number and severity of casualties
E Emergency services on scene and required

Primary triage and immediately necessary lifesaving treatment

Triage has been defined as the art of categorisation of patients according to severity of illness or injury to allow the greatest benefit for as many as possible [16]. An alternative definition is that triage is a temporary prioritisation of critical care [17].

Primary triage of patients at multiple casualty incidents is done before any patient treatment is started because it prioritises patients for treatment and is the priority medical activity at the incident site.

Diagram 1 - Triage Seive



It is widely accepted that any primary triage system should not only be based on an objective physiological assessment, but be such that it can be carried out reliably and effectively by non-medical personnel with a minimum of training. There are various systems that have been shown to do this such as the Triage Sieve used in civilian systems in the UK, Australia and Holland and throughout NATO and Simple Triage and Rapid Treatment ("START") used in the USA.

We recommend that the Triage Sieve (diagram 1) should be the method by which first-aiders and medical personnel in the oil and gas industry perform primary triage.

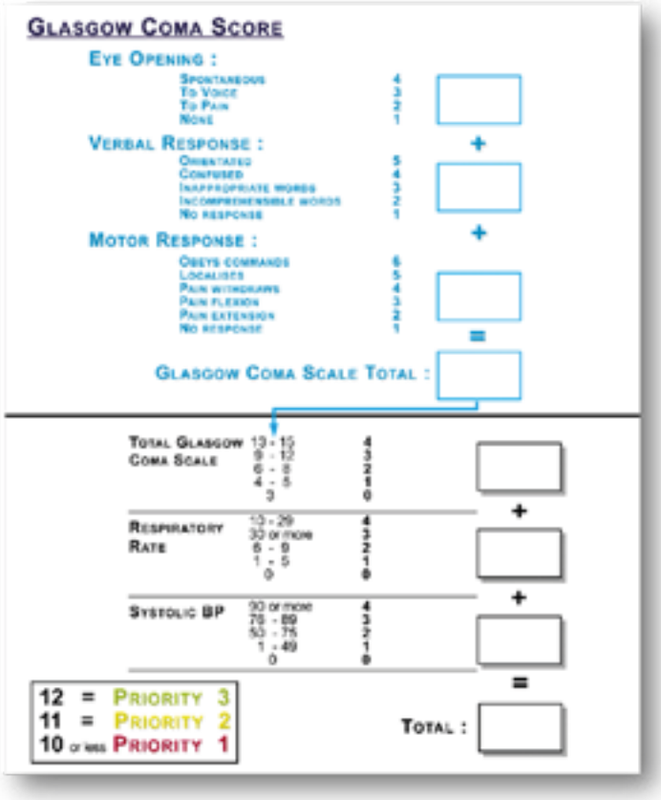
Any First-aider or medical professional carrying out primary triage is likely to feel pulled into treating patients, rather than completing the overall more important task of completing triage. Any such treatment should be limited to that which will be immediately lifesaving, such as, for a first-aider, arrest of catastrophic external haemorrhage and basic airway care, including use of the recovery position. Where possible such tasks should be delegated to another first-aider allowing the person doing primary triage to move on to next casualty.

Secondary Triage

The secondary triage of patients is a more prolonged process and can take place after initial resuscitation. It will usually be done away from the point of injury e.g., in the sickbay or "casualty clearing station".

The "Triage Sort" (diagram 2) is the most widespread, quantifiable method of performing secondary triage and is based on the formal physiological trauma scoring system known as the Triage Revised Trauma Score (TRTS). Assessment of the patient's physiological status (conscious level, respiratory rate and systolic blood pressure) can give an accurate prediction of the expected mortality associated with that patient's injuries.

Diagram 2 - Triage Sort



The triage sort, along with an anatomical assessment of injuries, will help on-site medical personnel and topside determine the need for further treatment, priorities for evacuation to definitive care and choice of the most appropriate mode of transport. Further considerations in planning patient evacuation are to be found in Appendix 1.

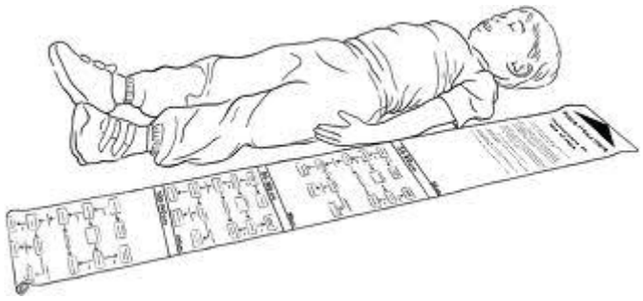
Paediatric Triage

Although remote industry personnel in general will deal with an adult population, there will be instances where children may be involved in an incident. The response to numbers of seriously injured children will be daunting for even experienced providers. Nevertheless, if industry providers might be faced with this scenario they need a practical and safe solution to assist in their decision making.

A child's physiology is not the same as an adult, so the application of the adult triage sieve will not be appropriate and if used will produce inaccurate results. As a child develops their physiology will change proportionally with length, so no one set of parameters will fit all children. Finally, we also need to work out when a child is mature enough to allow us to revert to using adult parameters.

The Paediatric Triage Tape[18] has been developed to address these issues. It provides an evidence-based practical tool to assist paediatric triage decisions based on the child's length and therefore its physiology and normal vital signs. The tape is unrolled and laid next to the child and the responder simply follows the age-adjusted triage sieve algorithm corresponding to the length of the child.

Diagram 3 - Paediatric Triage Tape



Communication pathways

Communication always presents a challenge in the management of multiple casualties, given the complex and dynamic natures of both the incident and the response.

Dysfunctional communication can result in transportation assets and evacuation being delayed, the wrong type of transport arriving, hospitals not being prepared or casualties being evacuated to the wrong level of care. Ensuring that the right casualty gets to the right place in the right time frame is heavily driven by effective communications.

Incident communications is a subject on its own. This paper will not attempt to cover the complete spectrum of communication issues, but will focus on reviewing communication pathways between the various parties involved in responding to the incident.

The following table outlines the probable lines of communication that exist as the medical part of controlling an incident with the parties involved, the information they need to pass to each other and the means by which that can be done (this table is written on the assumption that the medic can and will attend the scene of the incident, although it is recognised that this sometimes may not be

possible e.g., due to difficulties in getting to the site or because seriously injured casualties requiring his/her management have already arrived or are en-route to the “sick bay” or triage area).

Table 1 - Communication Pathways

Pathway	Who	How	Critical Information
1	First-aiders to Control Room	Radio, phone	ETHANE message.
2	Control Room to Medic	Radio, phone	ETHANE message.
3	First-aider to medic, on scene	Face to face	Update on casualty status, which patient most in need of medic's attention and their location.
4	Medic to First-aider, on scene	Face to face	Advice on continuation of triage, treatment and evacuation from scene.
5	Medic to Control Room	Radio, phone	Update on numbers in each triage category Transportation requirements.
6	Medic to Topside	Phone	Incident background. Casualty numbers and severity. Resources on scene and ability to cope. Specific definitive care requirements.
7	Topside to Medic	Phone	Confirmation on event characteristics. Specific casualty medical advice. Evacuation requirements.
8	Control Room to Medical Evacuation Provider	Phone	Number and type of evacuation assets required and medical resources to attend on them.
9	Topside to Hospitals	Phone	Advice on casualty numbers, type, severity and ETA. Specific requirements for definitive care.
10	Personnel with a command role e.g. in Control Room or Medical Incident Officer if deployed.	In writing	Maintain a log of key actions.

As can been seen, there are numerous communication pathways that have to transfer a great deal of information from people who most likely will be multi-tasking and under considerable stress. These pathways should be recognised and practised in advance of an incident.

Specific competencies

The particular competencies required for the successful management of an MCI vary between the roles and levels of personnel involved as defined in the OGP- IPIECA document Managing Health for Field Operations in Oil and Gas Activities [19].

First-aiders and security personnel: Basic/Level 1 or Advanced/Level 2 first-aiders who are most likely to be closest to the scene and available in numbers.

The “medic” or on-site doctor: Level 3 or 4 health-care professionals who will be the first advanced medically trained person closest to the scene.

Medical personnel arriving on transportation: Level 3 or 4 health-care professionals: as casualty evacuation means arrive medical personnel may arrive on scene to offer additional resources as well as acting as a medical escort on the transportation.

On scene management: the closest management to the incident. It is important to note that the medical management of the scene will only be one of their responsibilities; plant security, containment and possible fire suppression are all issues they may be dealing with simultaneously.

The Topside Doctor: offering medical advice and guidance on on-site treatment and evacuation decisions.

Hospital staff: Level 5 health-care professionals providing definitive care.

The competencies these personnel must include are scene assessment, communication, primary triage, immediate lifesaving treatment, secondary triage, patient management skills, knowledge of the MERP, ability to teach relevant skills to other members of the team and understanding of hospital emergency plans. These are covered in detail in the table below:

Table 2 - Specific competencies

Person	Tasks Required
Site first aid teams and security personnel	Apply and communicate an ETHANE scene report. Use a radio. Perform primary triage. Apply immediately necessary lifesaving treatment.
Site medic/doctor	All of above. In-depth knowledge of MERP, including MCI response. Ability to teach primary triage and immediately necessary lifesaving treatment to First-aiders and security staff. Ability to train management in aims and limitations of medical response. Understand secondary triage skills.
Site management	Understand the MERP, including the MCI plan, ETHANE and all relevant terminology, and especially the triage categories and the implications of these.
Medical personnel arriving on evacuation transportation	Interpret the medical scene assessment. Appropriate medical skills for types, numbers and severity of casualties and length of transfer.
Topside doctors	Understand the site MERP plan and associated terminology. Understand all aspects of secondary triage and give advice on casualty management and evacuation decisions. Understand the pressures created by the specific location of the incident and casualty load. Understand the location, transport times and arrangements (e.g. secondary transfers), capability and capacity of definitive care facilities.
Hospital staff	Understand the medical scene assessment and terminology within it. Have skills and facilities that match the casualties arriving. Understand how to initiate a hospital surge plan.

Equipment

The choice of equipment for responding to an MCI will depend on the outcome of a local risk assessment, the potential scale of the incident, and the unique circumstances of the operation including security, climate and geographical remoteness.

Equipment should be:

- “Embedded” so it is available as close and as soon as possible to a scene
- Relevant to the pre-assessed expected injury profile
- Available in appropriate quantities
- Appropriate for the skills of personnel using it
- Appropriate for the environment
- Transportable

An overview of equipment required for critical tasks is laid out in the table below:

Table 3 - Equipment

Critical Task	Equipment required	Notes
Scene reporting and primary triage		
All equipment		
Make and communicate a scene assessment	ETHANE aide memoire/record	
Perform primary triage	Algorithm and triage tags	Appendix 2 The ideal triage card
Count and communicate number and severity of casualties	Counting card	
Immediately necessary lifesaving interventions	Equipment for control of catastrophic haemorrhage and basic airway management	
Moving non-mobile casualties	Rugged, lightweight, compact stretcher system	
Secondary triage		
Set up a temporary casualty treatment area	Appropriate shelter/protection from the environment. Area marking tape	Any temporary shelter must be storable for long periods and be readily transportable close to the scene Sheltering should take into account weather and potential length of time on scene.
Perform secondary triage assessments	Triage tags with Triage Sort	
Continued medical management of the casualties	Relevant medical supplies in sufficient quantities	
Command and Control		
All MCI roles	Action cards and role identification tabards	
Interpreting scene reports and communicating both internally and externally regarding key areas such as availability of evacuation resources, patient destinations, and a list of the dead and missing	Pre-prepared management boards or notes for logging key information and activities Simple writing materials that will withstand adverse environments Copies of the MERP and MCI plans in a rugged, practical layout	To give access to key information and guidance that will enhance critical decision making

Summary

Multiple casualty incidents can occur at remote industrial locations. Even a limited number of seriously injured casualties can threaten to overwhelm the limited medical resources on site.

There is a duty of care, with subsequent liability, to prepare for such events. It can be argued that such preparation in industry does not always measure up to that in conventional environments.

We welcome discussion and comments on our suggestions in order to develop best practice guidelines in the critical areas of planning, initial reporting from the scene, primary triage, immediately necessary lifesaving treatment, secondary triage, communication pathways, specific competencies and equipment.

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Appendix 1 - Considerations in planning patient evacuation

- Is the patient's condition time critical?
- Can the patient be further resuscitated on site?
- Should the patient go to an in-transit or definitive care facility?
- Are such facilities accessible?
- What are the capacity, availability and suitability of the procurable transport?
- Could the patient be harmed by a road journey?
- Is air evacuation available and a better option?
- Can air evacuation be provided in time?
- Is the patient safe to travel by air at the altitudes involved?
- Can other patients travel with this patient?
- Is medical supervision available for the journey?
- What medical equipment and drugs are required for the journey?
- What treatment is required during the journey?
- Does the person accompanying the patient understand how to care for the patient and does he have written instructions?
- Is there a copy of the clinical record to go with the patient?
- Is the evacuation planned and confirmed from departure to arrival?

Appendix 2 - The ideal triage card

- Highly visible day or night
- Durable and waterproof
- Readily and securely attachable around a limb
- Triage categories can be changed up or down
- Indicates categories by number and colour
- Provides aide memoire for triage methods
- Has space for clinical notes
- Can indicate dead and expectant categories
- Each card uniquely numbered
- Facilitates counting of casualties in each triage category

Declaration of interest

TSG Associates www.smartmci.com design, manufacture and distribute equipment for multiple casualty management, including triage, and also provide training in these areas.

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Colin Smart Bsc
Senior Partner, TSG Associates
colin@smartmci.com

Bob Mark MB BS FIMC RCSEd
Medical Advisor, TSG Associates
drbobmark@smartmci.com

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Developments in Remote Health Care

Career Paths in Paramedicine: an international profile

John Quinn, MD, MPH,
Paramedic

jq@medsanbat.info

Medical Director
Medsanbat: combat medic program of Elena and Viktor Pinchuk, Kyiv / ATO, UKRAINE

Introduction

Paramedicine and Emergency Medical Services (EMS) is inherently a small community serving the public and touching the lives of many. Paramedics serve on ambulances, helicopters, as police, fire, other EMS providers, dispatchers and throughout the military to help patients at their greatest time of need. International conflict, battlefield and war medicine is an even smaller community and the pre-hospital component can vary widely in standards, practice and approach across regions. Remote Medicine is the speciality of trying to offer all of these international standards in resource poor and sometimes very austere environments. An interesting career path in paramedicine can be found in the broad experience, training and impact that American Paramedic Patrick Chellew brings to bear in this elite Remote Medicine and International EMS community. This brief snapshot profile highlights some interesting career paths available for paramedics willing to go the extra mile and willing to apply their basic and advanced principles wherever they find themselves on earth.

The Evolution of Remote Medicine with Patrick Chellew

Remote Medicine has been around since projects took people away from major cities and as long as international oil and gas, big contruction and other projects have been conducted. This includes doctors aboard ocean going vessels crossing the Atlantic in the 17th and 18th century, doctors standing by for the building of the Panama Canal dealing with infectious disease and workplace trauma and of course Surgeons, Priests and Doctors serving every war in the history of man. Remote Medicine has come in many forms and has until recently, not enjoyed a steady career path or clinical standard.

Medic Patrick Chellew began his paramedic career when EMS was born in the US, he graduated from paramedic school in 1983. He worked in various management and project groups throughout Northern California in fire, EMS and disaster medicine panels. Specifically, he spent over 10 years working throughout Oakland EMS on fire and ambulance 911 and supporting disaster operations in earthquakes, riots, fires and catastrophe. His experience in Northern California began not only to save lives by imposing systemic changes such as pedestrian safety projects, support with SWAT medic programs and EMS prevention but also by impacting the level of care and improving the EMS standard throughout an entire region and state. The basic principles learned in EMS at the basic and advanced levels are not only clinical and procedural, but also systemic and include a systems level approach to the patient and to the many resources required in a system to be efficient, provide best practices and provide review and audit to make the system better.

Patrick was also one of the founding voices to the DMAT (Disaster Medical Assistance Teams) in California. Patient care and best practices always came first, as opposed to advancement in career and chasing the next rank or medical certification feather to have in his cap. This career path allowed

for personal development, high clinical standards and the ability to see the big picture in Remote Medicine and International EMS systems; not what everyone would consider the most interesting when big trauma and emergencies are more attention grabbing and provide for better stories to tell than does preparation of disaster in remote areas.

However, as international paramedic work geared-up with the more recent conflicts and war in Afghanistan and Iraq, Patrick was there. He was there not as an observer, taking out of the system – but by being fortunate enough to provide and teach his paramedic experience to others by example. Working in the private sector and contracted out to US government projects such as Collected Enemy Ammunitions through the US Army Corps of Engineers and many other sensitive projects, Patrick started remote site clinics in Iraq, implemented best practice systems for local Iraqis and American forces and provided Public Health for populations caught in war and conflict.

This remote work continued for many years across the Middle East and Africa for multiple agencies and organizations offering emergency medical support in the oil and gas, peace and stability and humanitarian sectors. As we can see, the paramedic career path is not tied to riding in ambulances alone, and remote medicine is not only tied to oil and gas sites, but can take people to the far reaches of earth in providing pre-hospital medicine where it is needed most. Remote medicine is a diverse career path that is bound only to the creativity and ability of the practitioner to weather the austerity and in taking risk. For American paramedic Patrick Chellew, remote medicine was a conduit for helping supply human and health security for people.

Taking Kyiv as his second home while on leave from work in Iraq and Africa, he began to see the decay of healthcare and a near absent EMS system offering its people and medical staff very few resources across Ukraine. In a middle income country globally, Ukraine focused no resource to serve best practices in EMS for its people. There was a true need for capacity building and a total overhaul of a defunct health system. But change in Ukraine or to any institutional or governmental system can be obstructive, difficult and riddled with old regime cronyism; all proving significant barriers to change and to providing best practices in patient care. A catalyst was needed to spark opportunity for such change in a stale and defunct emergency services system in Ukraine.

So when demonstrations in Kyiv's Independence Square (Maidan Nezalezhnosti) began in November 2013 protesting at then Presidents' Viktor Yanukovych's decision under Russian pressure, not to sign an association agreement with the European Union (EU), violence and murder of protesters on the streets ensued [1]. Patrick saw at Maidan that the health system had no pre-hospital culture, were completely inadequate to deal with large mass gatherings like he had dealt with in the Bay Area of San Francisco as a paramedic manager and that help was needed to push the system into the 21st century to Disaster Medicine Standards [2].

But it was too soon for a systems level approach, shots were fired and triage needed to be set-up over the winter months of 2013 in a huge European central square underprepared for mass gatherings and military grade shootings. He spent much of his time in makeshift clinics he had helped start off of the main square and helped establish a field hospital in a safer location for the protesters that were being shot, killed and attacked night and day. Some days saw patients with cold and flu symptoms and exposure to subzero temperatures, while other days dealt with multiple blunt force trauma, ballistic trauma from old regime snipers and indiscriminant small arms fire, some seizures, allergic reactions and many cardiac conditions [3, 4]. These were busy days and medical resources were scarce with poor co-ordination and no communication between volunteer groups. After the overthrow of the old regime and an establishment of a new president and government in Ukraine, a short lull in violence ensued while regional players vied for political position. At this time, the Crimean Peninsula fell into position as a geo-political poker chip and neighbouring Russia began flexing its muscles and the economic, social and political components of conflict snowballed out of control. After all, para-medicine is not tied to riding around in ambulances alone and creating a worldview is needed to provide best practices and in seeing the big picture.
Russia was quick to respond to the power vacuum by annexing Crimea with no substantial international community response. Russian President Vladimir Putins' approval ratings at home soared and sights were set on even larger land grab targets in the East of Ukraine and possibly

regional capital cities [5]. Then Russian tanks rolled onto Ukrainian soil and started killing people, slaughtering troops and mortaring mobile medical teams and hospitals, shooting down multiple medical evacuation helicopters with patients; needless to say that the Ukrainian military and border guards were grossly underprepared [6].

Patrick Chellew could now see what good he could do as a paramedic to the system of EMS in Ukraine. Ukraine needed combat casualty care, Ukraine needed a paramedic program, and Ukraine needed an Emergency Medical Services (EMS) System that had a disaster plan and immediate help. Ukraine needed experience and expertise from the remote medicine and emergency medical services system. In passing and with help of many donors, volunteers and the Ukrainian World Congress, he helped to begin a Combat Life Saver (CLS) course. This program emphasized basic medical care for combat trauma as stated by best practices and evidence based medicine from the US military experience with guiding principles of the Tactical Combat Casualty Care (TCCC) methodology from experience gained in Iraq and Afghanistan. The program can offer successful students an Individual First Aid Kit (IFAK) to the US and NATO standard to a fledgling Ukrainian army, volunteers and irregular troops. There are many groups and programs duplicating this acute need. The Ukrainian World Congress spearheaded this need with help from Patrick Chellew and many others.

These efforts of TCCC and CLS programs have graduated over 10,000 Ukrainian war fighters and military personnel, with over 9000 IFAKs in circulation serving the ATO in the violent East - something the Ministry of Defence were completely unable and incompetent to achieve on their own without help; Medic Chellew's new sights were set on a Combat Medic programme. With the Ukrainian World Congress and a new donor and programme lead from Ukrainian patriots and philanthropists Viktor and Elena Pinchuk in Ukraine. Patrick finally had the resources to make a new combat medic program to fill a desperate need and offer guidance to a major gap in medical services for Ukrainian war-fighters dying every day on the battlefield. This new programme is Medsanbat (www.medsanbat.info) and is exploding with student applicants and graduates, still needs investment, but offers true capacity building for medics headed to the East and to the fierce fighting with Russian troops.

Viktor and Elena Pinchuk have donated over 1.4 million US dollars to this programme and have expanded into a staff of over 12 in Kyiv, and over 25 instructors throughout the East supporting training, coordination, translating, drafting evacuation protocols for the military, mobile hospital training, implementation and accrual, legislative changes to Ukraine's military medical doctrine, attending conferences for TCCC and logistics of medic bags to war-fighter medics [7]. Advanced practice combat medic bags from the US and UK were purchased and after support from old colleagues and some graduates of the course in the State Security Forces of Ukraine (SBU), over 150 bags are in country with another 150 on order of varying advanced medical capacity. Instructors from California, Illinois, Florida and the Carolinas were brought in to lead this modular combat medic programme offered at the highest standards to serve the Ukrainian warfighter in time of greatest need. The program designed entirely by his experience in EMS in California and international medicine in conflict zones, had funding, a system to develop and the right man, in the right place at the right time. Remote Medicine and Para-medicine has many routes and if motivated can offer paramedics a wide variety of work and impact to EMS and medicine globally.

To date, the medic programme has exposed TCCC training to over 950 doctors, nurses, doctors assistants and combat life savers (CLS). There are approximately 150 - 200 students that have been selected as combat medics in acute need and have been given the advanced combat medic bag that are directly supporting the ATO. Due to limited resources and limited time of a country at war, there are presently only basic metrics for completion of the course, and not enough bags for all students. At present there is no written exam and only select use of extended skills sheets, but the exposure to the TCCC course material is a starting point for further instruction and review; especially for the Ministry of Defence in making it a sustainable programme.

Many students take the course more than once to hone-in on their skills. After all, para-medicine is not a static profession and requires hours and weeks worth of annual continuing education to ensure competency. More help is on the way by way of donations and synchronization with the Ukrainian

Ministry of Defence and more recently, the US Military based in Europe and some other NATO countries. More collaboration is needed to make the programme robust and to help trainers master best practices. And the system will be sustainable by training the trainer programmes and eventual hand over to a limping but able Ministry of Defence Medical Directorate. This is truly an example of how one paramedic with a vision to offer something more than lip service from his own country and life experience is saving lives on the field of battle and in dimly lit clinics throughout the war zone that is Ukraine. Para-medicine is a great career and its path is one each paramedic can make of their own without limitations.

Summary

North America offers some of the best medical practices and philanthropic pushes in the world. And it is one of the most generous regions on earth because of the EMS systems we provide and because of the products of these systems like paramedic Patrick Chellew. Patrick is taking his experience, his training and American attitude to the places that need it most. Remote Medicine is a vocation that is passed from person to person for those who have a hunger for learning, for doing good and for helping and freeing the oppressed; Medic Patrick embodies this in his word, in his actions and in the soldier and civilian patients that benefit from emergency intervention on the battlefield from Russian weapons systems firing every-day. No one knows what the next major action by Russia will be, despite a ceasefire in name alone that leaves over 13 dead per day since its signing. The constant of tactical casualty care and combat medicine that the above programmes provide will be a force multiplier and will ultimately save lives. It is the American identity and indeed the nature of EMS and remote medicine to help those in need and para-medicine is a great way to do it.

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[7] for an exhaustive list of accomplishments and projects please visit: www.medsanbat.info and https://www.facebook.com/medsanbat

John Quinn, MD, MPH,
Paramedic
jq@medsanbat.info

Medical Director
Medsanbat: combat medic program of Elena and Viktor Pinchuk, Kyiv / ATO, UKRAINE
www.medsanbat.info

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'Remotely Important'

Editor:

Simon Harvey, a well known 'Medic about town' wrote recently reflecting on the continuing front end angst about the setting of standards for Medic training and refresher training, as well as the guidance about equipment and facilities etc.

This appeals to me as I also had the rather simple view of the world of the IRHC being supported to set standards - a little like the Royal Colleges have done for a few hundred years now - and then provision (and even assessment) can be franchised out to appropriate providers. Quite how the industry always manages to then screw this up by allowing other factions to seek to exert control (without a mandate to do so - and you know who I mean if you are reading this) is beyond me. Very few of these other factions in fact have the academic depth to generate what is needed.

So I'm with Simon on this one. Support the IRHC in the context of its move under the umbrella of the RCS(Ed) and let's move on with the real work.

Offshore Medics Training the Offshore Installations and Pipeline Works (First aid) 1989 and the Equipping of Rig, Platform and Ships Sickbays. Also a note on Degree level Remote Health Care Providers why?

A Point of View by Simon Harvey

I recently assisted a company in south Wales to set up and run an Offshore Medics course. They are very enthusiastic and are at present the only providers in Wales (correct me if I am wrong) Now a lot of people who know me are aware that I have some very odd ideas on what we as Offshore Medics should be learning. Couple this with the less than attentive HSE as to course content and regulations that are so old some of the course candidates are younger than them.

So where did I start, well I had to borrow formats from somewhere and the obvious choice is who I do my requalification with, This is CAPITA at present and they have a beautifully crafted course with (in my opinion) a really good balance that fits my mind set on what an Offshore medic should know. Building this course was quite stressful and I produced a course programme from pretty much a blank page building on the FPOS side of the course in the second week.

I started by stating the aims and then tried my hardest to put them off by telling them the pitfalls that await them if they are not wary. To me surprise they came back after lunch, so there was nothing else for it but to continue. The training point I wanted to get a cross is that the 1989 regulations and direction from HSE is very limited on equipment for sickbays and what a medic should know. I wanted the “Newbie” to understand that in his forthcoming career he will find very well equipped sickbays with ECG machine ready to go, cables connected, “dots” on the cables and a pictogram showing where they go and an email address where they should go for reporting or they will find a shabby dirty room with out of date equipment, missing equipment and very weak handover notes and four unwell people at their door in the first 24 hours, whilst being castigated for not doing the inductions properly (this has actually happened).

I got to think why is it like this, why can we not have a review of the regulations. In my middle aged dyslexic mind why can we not equip our sickbays to the same standard as Paramedic run

ambulance? Surely the people we are treating are exactly the same as those on the street. They the (ambulance service) have moved forward and yet we have not (regulation wise) I concede that some individual companies have invested a great deal in the healthcare provision yet some have not. Cries of “no budget” and “where does it say that in the regulations”. This is where I think IRHC should concentrate its “fire” next. Get the regulation updated to a best practice as used in the Ambulance environment. Ask companies to “ring fence” sickbay upgrades. Auditors to report on the suitability of the sickbay and its equipment levels, improved communications which have back up, ideally Telemedicine I first saw this used in Gibraltar in 1998 and was mightily impressed. It is now 2015 and how many rigs, ships and platforms have it? I don’t know maybe this missive will provoke an answer. I fully understand the IRHC requirement to improve the levels of training and I have asked my friends in South Wales to “get onboard” with IRHC but the question 'yes but what will it do for us?' needs an answer. There seem to be a hiatus at the moment with Medic’s training. I personally think that University based courses are far too much and I despair at the thought of another group of health care professionals with degrees in medicine yet who fail when it comes to people skills and common sense.

The old adage “ work out the square root of a milk carton, but can’t open it , springs to mind”

Simon Harvey

mithras1963@hotmail.com

'Remotely Useful'

This section is available for book reviews, equipment reviews and links to other organisations that could provide some useful help to the readership. Content is a mixture of commissioned material and unsolicited contributions, the Editor having reviewed appropriateness for inclusion.

Letters

The letters section is available to readers to feedback on elements of the Journal or to respond to articles. Responses to articles would be expected to be evidence based and list appropriate references if disagreeing. 'Me too' publications are discouraged!

The journal continues to be keen to receive any worthwhile contributions and help can be given to get material to publishable standards. Contact editor@irhc.co.uk. Please contribute. There is a need for book reviews, equipment and diagnostics reviews and especially letters. The next edition is intended to be published January 2016

Footnote

The Journal of the Institute of Remote Health Care is a service to all levels of membership. Its aim is to encourage equity in the development of the speciality.

All communication should be to the Editor, Dr Malcolm J Valentine, via email

editor@irhc.co.uk

The Editors decision is final in all aspects of publication. If quoting articles from the Journal, we respectfully ask that the Journal's role is acknowledged.

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Notes for Contributors:

Leading Article

Leading Articles will either be commissioned to deal with a specific topic or a personal view on an issue of importance to remote health care. Commissioned articles would be preferably referenced. Personal views should be properly referenced in Vancouver style. A leading article should be in the range of 1000 – 2000 words.

Original Articles

Original Articles should be in the range of 1500 – 3000 words in length. They should be referenced in Vancouver style. For instance, a journal article:

Author A and Author B (2010) Delivering Remote Health Care. *Journal of Existing Group* **Vol 1 Number 5:** pages 10 - 15

A paper should represent original work preferably an item of research that contains an accepted method of evaluation. It may be possible to include a non-research paper if it was sufficiently critically self aware.

Developments in Remote Health Care

This section is available for non-researched contributions that nevertheless would have merit in being printed. Practical innovations in remote health care can be included here. Successes – and failures – can be covered. Case reports are particularly valuable and should be anonymised and written in the third party style. Reference to available knowledge on the issue being addressed would be helpful. The Editor will review these contributions and seek clarification where necessary before publication. Articles here should be no more than 1500 words.

'Remotely Important'

This section is a sort of ‘soap box’ section that can include hints, tips, ideas, requests for people to respond to an idea or concept or a commentary on a current issue affecting Remote Health Care. Brief articles of up to 500 words can be included here (occasionally longer at the Editor’s discretion); they need to be honest and non-offensive, but not referenced.

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