Agreement between UK Maritime Coastguard Agency medical referees

I. Rustom¹ and T. Carter²

¹University Hospitals Birmingham, Selly Oak – Occupational Health Department, Birmingham, UK, ²Maritime and Coastguard Agency – Seafarer Safety and Health Branch, Southampton, UK.

Correspondence to: I. Rustom. e-mail: isamrustom@gmail.com

Background
The seafaring industry remains a hazardous occupation that requires sophisticated systems of risk and fitness assessment.

Aims
To study the extent of agreement between the medical referees (MRs) and the determinants of agreement between the MRs.

Methods
A total of 232,878 seafarer medical examinations were carried out by approved doctors (ADs) between 2003 and 2009. The extent of agreement between the MRs was studied in those cases considered by the MRs because the seafarer appealed against the AD’s decision. The identified determinants of agreement between the MRs were analysed.

Results
There were 465 appeal cases that covered all medical categories. Cardiovascular disease was the most frequent cause of appeal, in 31% (143) of cases. The MRs upgraded the seafarer’s fitness category in 58% (271) of cases, upheld the initial AD’s decision in 40% (184) and downgraded the seafarer’s fitness category in only 2% (10) of cases. There was no statistically significant difference between the MRs when they assessed the fitness of seafarers.

Conclusions
MRs seemed to agree with each other as they upgraded the fitness category of seafarers to allow more of them to work at sea. It appears that the outcome of the appeal process was multifactorial and was affected by a combination of multiple variables.

Key words
Appeal; medical referee; seafarer.

Introduction
Merchant seafaring has long been regarded as one of the most hazardous occupations in Britain [1]. Seafaring has been identified as the second most hazardous occupation after commercial fishing in Great Britain, and is more hazardous than construction, manufacturing and other industrial sectors [2]. Mortality studies of British, Danish and Polish seafarers on board merchant ships all indicate a similar pattern: non-natural causes (accidents) accounted for 40–50% of all deaths in these studies and diseases accounted for 36–42% of all deaths [3–5].

It is a legal requirement of the Merchant Shipping (Medical Examination) Regulations 2002 that anyone employed or engaged on a seagoing ship must have a medical certificate attesting to their fitness for the work for which they are employed. Seafarer medical examinations are conducted by approved doctors (ADs), who are formally appointed by the secretary of state, but the responsibility for appointment is delegated to staff of the Maritime and Coastguard Agency (MCA) [6].

The purpose of the seafarer medical assessment is to ensure that the individual seafarer is fit for the work for which he or she is to be employed, taking into account the particular risks associated with his or her duties at sea.

Based on the medical assessment, the AD will issue a certificate in one of the following fitness categories:

Category 1: fit for sea service, with no restrictions.
Category 2: fit for sea service but with restrictions.
Category 3: temporarily unfit for sea service.
Category 4: permanently unfit for sea service.

Restrictions may include the types of duties that can be undertaken, operational area and type of vessel. The fitness certificate may also be issued for a period less than the normal duration of 2 years [7].

Seafarers have a right to seek a review by an independent referee, who is appointed by the MCA on behalf of the secretary of state, if they are not satisfied with the decision of an AD. Seafarers who request a review must apply within 1 month of the date on which the seafarer is given notice by the AD of refusal, restriction or suspension of
a certificate. The referee will see the seafarers and assess their medical history and clinical findings to determine whether the AD took an appropriate decision on their fitness category. They may review or request clinical reports or investigations and will, if they do not endorse the AD decision, issue a revised certificate of fitness.

The MCA standards are based as far as possible on evidence of risk, but the evidence base on maritime health is limited [8,9]. In addition, where the MCA recognizes that specific existing medical standards are no longer in line with developments in medical treatment, ADs have been encouraged to indicate to seafarers that they should consider asking for a review by a medical referee (MR), as described above [10,11]. The 2002 fitness standards are concerned with risks of recurrence of existing conditions, which could increase the probability of illness while at sea, and with forms of impairment that could interfere with duties such as navigation, engineering, food preparation and responding to emergencies [12]. The 2002 standards applied throughout the period studied but have since been replaced (in early 2010) [13].

The MR’s case review committee meets twice a year, chaired by the MCA’s chief medical adviser, to discuss all appeal cases, concentrating on those that were considered difficult. Its purpose is to improve consistency of decision taking among referees and to identify where current standards and guidance need revision. It does not alter any fitness decisions already taken by referees, but it identifies those that the peer group considers to be valid and thus precedents for future decisions.

This study aimed to investigate the extent and determinants of agreement between the MRs when assessing the fitness of seafarers.

Methods

The following categories of data were extracted from the Seafarer Medical Review—Referee’s Report (MSF 4108) forms, which form the basis for 6-monthly peer case review committee meetings of referees: age, gender, referee code, medical category, type of work, AD’s decision category, MR’s decision category, result of appeal and MRs case review committee meeting endorsement of decision (Appendix 1, available as Supplementary data at Occupational Medicine Online).

Each MR was assigned a unique non-transferable code (1–12) to ensure confidentiality. MRs are located across the UK, and they have knowledge of maritime health. They come from a range of backgrounds: general practice, hospital medicine, army, navy, Health & Safety Executive or the Driver and Vehicle Licensing Agency. The majority are occupational physicians.

The medical conditions of those seeking review were coded using the 16 categories on the MSF 4108 forms. Cancers, blood disorders, digestive, genito-urinary, infections, skin, general and pregnancy categories were placed in a single category ‘miscellaneous’ for the analysis. Type of work was categorized as deck, engine, catering and others. Others included scientist, technician, entertainer, franchise operator, casino staff and medical staff.

The AD’s decision was categorized into one of the four fitness categories described in the medical assessment section. No seafarers in category 1 ‘fit’ had appealed.

The result of a review was considered in terms of the difference between the AD’s decision and that of the MR’s, which were classified as follows:

1. No change (same category, but could alter the imposed restrictions).
2. Upgrade (MR’s decision gave the seafarer more flexibility to work at sea).
3. Downgrade (MR’s decision was stricter than the AD’s decision, further limiting the seafarer work at sea).

Data were entered using Excel software (Microsoft Office 2007®) and analysed using SPSS for Windows (Statistical Package for the Social Sciences, version 16.0). For non-parametric group comparison of categorical (ordinal and nominal) values, the chi-square test was used. All indicated P values were two sided, and P < 0.05 was regarded as statistically significant. Ninety-five per cent confidence intervals were used.

Calculating the ratio between the upgraded cases and the downgraded cases (upgraded/downgraded) for each MR gives an indication of potential disparity between the MRs. A higher ratio would indicate that the MR tends to be among the ‘hawks’, and a lower ratio would indicate that the MR tends to be among the ‘doves’ when considering the appeal case. It was not possible to calculate the inter-rater reliability between the MRs themselves as they looked at different cases with different circumstances, job tasks, investigation results and the period of illness of each appeal case.

The Cambridge Local Research Ethics Committee confirmed that the study did not require ethical approval due to its nature (retrospective), the anonymized data (no names, date of birth or addresses to identify the seafarer) and the statutory nature of the medical examination.

Results

From May 2003 to May 2009, 232 878 seafarer medical examinations were carried out by ADs. Of these seafarers, 465 appealed against the AD’s decision and were further assessed by MRs at 13 referees’ case review committee meetings. Of those who appealed, 96% (444) were male, and the mean age was 43.8 (SD = 14.4 years) for all seafarers and 27.3 (SD = 9.2 years) for females. The median age was 53 years, over one-third (34%) were aged between 50 and 59 years, and 6% (28) of seafarers were under the age of 20 (Table 1). The commonest medical category for appeal cases was cardiovascular diseases (31%), followed by endocrine disorders (14%) and sensory disorders...
In the endocrine disorders category, 59% of appeal cases were diabetes and 29% were obesity (body mass index > 30). In the sensory deficits category, 73% were vision related and 23% were hearing related.

In 58% of cases the MR upgraded the decision on fitness; in 40%, the assessment remained the same and in 2%, the seafarer’s fitness was downgraded.

The workload was unevenly distributed between the MRs (Table 2), and half the MRs could be categorized on a ‘dove’ and ‘hawk’ spectrum based on their interpretation of the standards (Table 3).

There was a significant association between the age group and the MR’s decision ‘fit with restrictions’ ($\chi^2 = 33.0$, df = 15, $P < 0.05$). In the under-20s age group, 43% (12 out of 28) were considered ‘permanently unfit’ by the MRs, which was a statistically significant excess (Table 4).

‘Fit with restrictions’ was the most frequently used fitness category, and there was a significant association between the MR’s decision and the medical categories ($\chi^2 = 80.5$, df = 30, $P < 0.05$). Mental health cases were significantly associated with an excess of the ‘permanently unfit’ category (Table 5).

There was no significant association between the referee code and the MR’s decision in assessing the fitness of seafarers. There was no significant difference in the decisions taken by MRs regarding the fitness of seafarers (Table 2).

### Table 1. Medical categories; mean age, range and standard deviation

<table>
<thead>
<tr>
<th>Medical category</th>
<th>Number, n (%)</th>
<th>Mean age (years)</th>
<th>Range (min–max; years)</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiovascular</td>
<td>143 (31)</td>
<td>53.1</td>
<td>20–74</td>
<td>7.7</td>
</tr>
<tr>
<td>Endocrine</td>
<td>66 (14)</td>
<td>40.0</td>
<td>18–60</td>
<td>12.1</td>
</tr>
<tr>
<td>Sensory</td>
<td>60 (13)</td>
<td>35.3</td>
<td>16–70</td>
<td>15.6</td>
</tr>
<tr>
<td>Neurological</td>
<td>44 (10)</td>
<td>41.7</td>
<td>20–61</td>
<td>12.9</td>
</tr>
<tr>
<td>Respiratory</td>
<td>42 (9)</td>
<td>29.5</td>
<td>16–65</td>
<td>13.5</td>
</tr>
<tr>
<td>Mental</td>
<td>38 (8)</td>
<td>37.8</td>
<td>17–60</td>
<td>12.7</td>
</tr>
<tr>
<td>Musculoskeletal</td>
<td>36 (8)</td>
<td>51.9</td>
<td>17–66</td>
<td>14.0</td>
</tr>
<tr>
<td>Genito-urinary</td>
<td>13 (3)</td>
<td>45.9</td>
<td>25–63</td>
<td>12.2</td>
</tr>
<tr>
<td>Digestive</td>
<td>9 (2)</td>
<td>40.8</td>
<td>28–59</td>
<td>10.7</td>
</tr>
<tr>
<td>Blood</td>
<td>8 (2)</td>
<td>46.0</td>
<td>21–61</td>
<td>15.4</td>
</tr>
<tr>
<td>Cancer</td>
<td>6 (1)</td>
<td>53.7</td>
<td>34–61</td>
<td>11.7</td>
</tr>
<tr>
<td>Total</td>
<td>465 (100)</td>
<td>43.8</td>
<td>16–74</td>
<td>14.4</td>
</tr>
</tbody>
</table>

### Table 2. MR’s decision and workload for 12 MRs

<table>
<thead>
<tr>
<th>Referee code</th>
<th>MR’s decision, n (%)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fit</td>
<td>Fit with restrictions</td>
</tr>
<tr>
<td>1</td>
<td>5 (15)</td>
<td>18 (55)</td>
</tr>
<tr>
<td>2</td>
<td>3 (16)</td>
<td>10 (53)</td>
</tr>
<tr>
<td>3</td>
<td>13 (30)</td>
<td>16 (36)</td>
</tr>
<tr>
<td>4</td>
<td>2 (8)</td>
<td>16 (61)</td>
</tr>
<tr>
<td>5</td>
<td>4 (11)</td>
<td>22 (58)</td>
</tr>
<tr>
<td>6</td>
<td>8 (12)</td>
<td>37 (54)</td>
</tr>
<tr>
<td>7</td>
<td>6 (13)</td>
<td>20 (44)</td>
</tr>
<tr>
<td>8</td>
<td>0 (0)</td>
<td>4 (80)</td>
</tr>
<tr>
<td>9</td>
<td>15 (16)</td>
<td>58 (61)</td>
</tr>
<tr>
<td>10</td>
<td>5 (8)</td>
<td>35 (57)</td>
</tr>
<tr>
<td>11</td>
<td>5 (17)</td>
<td>16 (55)</td>
</tr>
<tr>
<td>12</td>
<td>0 (0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Total</td>
<td>66 (14)</td>
<td>252 (54)</td>
</tr>
</tbody>
</table>

### Table 3. MR’s decision in relation to referee code

<table>
<thead>
<tr>
<th>Referee code</th>
<th>MR’s decision, n (%)</th>
<th>Number of cases</th>
<th>Ratio (upgraded/downgraded)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Downgraded</td>
<td>No change</td>
<td>Upgraded</td>
</tr>
<tr>
<td>1</td>
<td>1 (3)</td>
<td>14 (42)</td>
<td>18 (55)</td>
</tr>
<tr>
<td>2</td>
<td>0 (0)</td>
<td>5 (26)</td>
<td>14 (74)</td>
</tr>
<tr>
<td>3</td>
<td>2 (5)</td>
<td>15 (34)</td>
<td>27 (61)</td>
</tr>
<tr>
<td>4</td>
<td>0 (0)</td>
<td>11 (42)</td>
<td>15 (58)</td>
</tr>
<tr>
<td>5</td>
<td>2 (5)</td>
<td>11 (29)</td>
<td>25 (66)</td>
</tr>
<tr>
<td>6</td>
<td>1 (1)</td>
<td>29 (43)</td>
<td>38 (56)</td>
</tr>
<tr>
<td>7</td>
<td>0 (0)</td>
<td>23 (50)</td>
<td>23 (50)</td>
</tr>
<tr>
<td>8</td>
<td>0 (0)</td>
<td>1 (20)</td>
<td>4 (80)</td>
</tr>
<tr>
<td>9</td>
<td>3 (3)</td>
<td>32 (34)</td>
<td>60 (63)</td>
</tr>
<tr>
<td>10</td>
<td>1 (2)</td>
<td>30 (49)</td>
<td>30 (49)</td>
</tr>
<tr>
<td>11</td>
<td>0 (0)</td>
<td>12 (41)</td>
<td>17 (58)</td>
</tr>
<tr>
<td>12</td>
<td>0 (0)</td>
<td>1 (100)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Total</td>
<td>10 (2)</td>
<td>184 (40)</td>
<td>271 (58)</td>
</tr>
</tbody>
</table>

1Referees 2, 4, 7 and 11 had no downgraded cases, so their ratios were 0.
2Referees 8 and 12 were excluded from the analysis as they only considered five and one cases, respectively, and had no downgraded cases, so their ratios were not applicable (n/a).
There was no significant association between the type of work and the MR’s decision, which meant that type of work did not influence the MR’s decision (Table 6).

The MR’s case review committee endorsed 88% (411) of the decisions taken by the MRs and had reservation on 12% (54). The MR’s committee agreed on all of the 10 downgrade decisions considered by MRs, 86% (233) of upgrade decisions and 91% (168) of ‘no change’ in fitness cases.

Table 4. MR’s decision in relation to age group

<table>
<thead>
<tr>
<th>Age group (years)</th>
<th>MR’s decision, n (%)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fit</td>
<td>Fit with restrictions</td>
</tr>
<tr>
<td>&lt;20</td>
<td>4 (14)</td>
<td>11 (39)</td>
</tr>
<tr>
<td>20–29</td>
<td>16 (20)</td>
<td>38 (48)</td>
</tr>
<tr>
<td>30–39</td>
<td>6 (11)</td>
<td>26 (46)</td>
</tr>
<tr>
<td>40–49</td>
<td>14 (15)</td>
<td>54 (59)</td>
</tr>
<tr>
<td>50–59</td>
<td>15 (9)</td>
<td>99 (64)</td>
</tr>
<tr>
<td>≥60</td>
<td>11 (20)</td>
<td>24 (44)</td>
</tr>
<tr>
<td>Total</td>
<td>66 (14)</td>
<td>252 (54)</td>
</tr>
</tbody>
</table>

Table 5. MR’s decision in relation to medical category

<table>
<thead>
<tr>
<th>Medical category</th>
<th>MR’s decision, n (%)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fit</td>
<td>Fit with restrictions</td>
</tr>
<tr>
<td>Cardiovascular</td>
<td>15 (11)</td>
<td>96 (67)</td>
</tr>
<tr>
<td>Endocrine</td>
<td>5 (7)</td>
<td>37 (56)</td>
</tr>
<tr>
<td>Sensory</td>
<td>15 (25)</td>
<td>28 (47)</td>
</tr>
<tr>
<td>Neurological</td>
<td>2 (4)</td>
<td>18 (41)</td>
</tr>
<tr>
<td>Respiratory</td>
<td>9 (21)</td>
<td>20 (48)</td>
</tr>
<tr>
<td>Mental</td>
<td>2 (5)</td>
<td>11 (29)</td>
</tr>
<tr>
<td>Musculoskeletal</td>
<td>12 (33)</td>
<td>17 (47)</td>
</tr>
<tr>
<td>Genito-urinary</td>
<td>4 (31)</td>
<td>7 (54)</td>
</tr>
<tr>
<td>Digestive</td>
<td>0 (0)</td>
<td>7 (78)</td>
</tr>
<tr>
<td>Blood</td>
<td>1 (12.5)</td>
<td>6 (75)</td>
</tr>
<tr>
<td>Cancer</td>
<td>1 (17)</td>
<td>5 (83)</td>
</tr>
<tr>
<td>Total</td>
<td>66 (14)</td>
<td>252 (54)</td>
</tr>
</tbody>
</table>

Table 6. MR’s decision in relation to type of work

<table>
<thead>
<tr>
<th>Type of work</th>
<th>MR’s decision, n (%)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fit</td>
<td>Fit with restrictions</td>
</tr>
<tr>
<td>Deck</td>
<td>37 (16)</td>
<td>119 (51)</td>
</tr>
<tr>
<td>Engine</td>
<td>13 (12)</td>
<td>61 (58)</td>
</tr>
<tr>
<td>Catering</td>
<td>5 (13)</td>
<td>19 (49)</td>
</tr>
<tr>
<td>Others</td>
<td>11 (13)</td>
<td>53 (61)</td>
</tr>
<tr>
<td>Total</td>
<td>66 (14)</td>
<td>252 (54)</td>
</tr>
</tbody>
</table>

Discussion

This study found that where a seafarer appealed an AD’s assessment of seafaring fitness, the MR upgraded the medical category in 58% of the cases and downgraded it in only 2%. The proportion upgraded varied from 49% to 71% in those referees carrying out more than five assessments, suggesting that MRs were consistent with each other in upgrading the fitness category of seafarers to allow more of them to work at sea. In 40% of the cases, the fitness category remained unchanged. Six MRs could be placed on a ‘dove’ and ‘hawk’ spectrum based on their interpretation of the standards. Scrutiny of decisions at peer review case meetings may have an effect on the consistency of decision taking.

The strengths of this study include the large population base and the identification of factors influencing the MR’s decision on fitness. The limitations include the lack of similar studies with which to compare its outcome and the difficulty of analysing all the variables affecting the MR’s decision.

This study investigated the four main identified determinants of agreement between the MRs in assessing the fitness of seafarers: age group, medical category, referee code and type of work.
MRs preferred to use the ‘fit with restrictions’ category, which had a statistically significant relationship with all age groups (20–60+ years). Men aged between 50 and 59 years comprised one-third of the cases studied. This may mirror the age structure of the population, but it could reflect either fear of unemployment or increasing frequency of ill-health with age. However, the MRs used the ‘permanently unfit’ category more in the under-20s age group. This difference could be explained by colour vision defects (the eyesight standards specify test results in detail) [10] and because they were often cadets or new entrants who wanted to pursue a career at sea but had an existing medical condition that rendered them unfit or had the potential to progress and affect their career at sea, for instance epilepsy and severe asthma.

Cardiovascular diseases were the commonest category. Risk management is important as cardiovascular diseases led to 87% of deaths from natural causes in seafarers employed in the British merchant fleet between 1986 and 1995 [3], 80% of deaths in seafarers employed in the Royal Fleet Auxiliary between 1976 and 2005 [14], 72% of deaths in seafarers employed on Polish vessels between 1960 and 1999 [15], and 66% of deaths in Danish seafarers between 1986 and 1993 [4,16].

Analysis of cardiovascular data from the MSF 4108 forms showed a general theme for decision taking by the MRs. They assessed whether there were any continuing limitations to exercise tolerance, increased risks of sudden incapacity, foreseeable risk of the condition progressing or unacceptable high levels of risk factors, supplemented by favourable cardiac investigations results or a cardiologist’s report.

Diabetes and obesity were the second largest group of the appeal cases. Although those with diabetes controlled by diet or oral medication were allowed to work at sea, the use of insulin was generally a cause of permanent unfitness. Referees took account of glycaemic control, glycosylated haemoglobin levels and hypoglycaemic awareness when taking decisions that enable some insulin users to work in limited roles [17].

Obesity has implications both for a person’s capability to do their duties, especially in an emergency, and for long-term risks of chronic diseases [18]. Obese seafarers are usually urged to reduce weight by weight reduction targets set by ADs, but when the initial weight is extreme or there are concerns about physical ability or multiple risk factors, they may have their duties restricted or be made unfit. Such ADs’ decisions are sometimes contested.

Human error is the predominant cause of maritime accidents according to the UK Marine Accident Investigation Branch. The two most common human factors were improper watch-keeping or lookout and errors of judgement related to vision [19,20].

Fitness standards are closely specified but tailored to the duties to be performed. MRs used their knowledge of these duties to upgrade more than half of those with sensory defects.

Both good visual acuity and unimpaired colour vision are essential for ‘lookout’ duties (looking seawards to check for hazards and other vessels). This would explain the large number of appeals on vision (acuity, colour or monocular).

While ‘fit with restrictions’ was the main fitness category considered by MRs across all medical categories, more than one-third of the mental disorder cases were classed as ‘permanently unfit’. MRs tended to be stricter with mental disorders. Many jobs at sea are safety critical; therefore, impaired performance from any cause, including a psychological one, may put other seafarers, passengers and the vessel at risk [21].

The relationships with measurable variables like age group, medical category, referee code and type of work were studied. It appears that the outcome of the appeal process was multifactorial and was affected by a combination of the above variables. This study poses a number of questions that are relevant to MCA and similar appeal systems. Other factors that might affect decisions on fitness need to be explored. These include the way in which standards are expressed and the discretion given to their application; the clarity with which the AD explains the rationale for their decision to the seafarer; the readiness of employers to make adaptations to keep seafarers working; and the hypothesis that ADs with occupational medicine qualifications or maritime experience would be less likely to have their decisions altered on appeal. The consistent upgrading of fitness category may be because those who have conditions on the boundaries of standards are most likely to seek a review, but it may also indicate a lack of equity for those who accept the AD’s decision and do not appeal against it. This too needs further investigation.

**Key points**

- Medical referees consistently upgraded the fitness category of seafarers to allow more of them to work at sea.
- Medical referee decisions on the fitness of seafarers varied by age group and medical category.
- Medical referees preferred to use the ‘fit with restrictions’ category more than any other fitness categories as this may allow the seafarer to remain in employment.

**Conflicts of interest**

None declared.
Acknowledgements

We would like to thank the administrative staff in the MCA and Dr Isla Gemmel from the University of Manchester for her statistical advice in the original dissertation work.

References