Original Article

Aeromedical decision - making in Indian civil aviation: Current status and trend analysis

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ABSTRACT

On scrutiny of medical records of civil flight crew at DGCA, certain records are put up to the DMS (AM) and Senior Advisor (Av Med) at Air HQ prior to approval. These include all cases of permanent unfitness of flight crew, cases of flight crew appeals against decision of Aeromedical Examiners (AMEs) or Aeromedical Centres (AMCs) and cases where the medical assessor at DGCA disagrees with the opinion of AMEs/ AMCs. On a case-to-case basis, such records may be put up to senior functionaries at Air HQ as deemed necessary. During the period Jan 2001 to Aug 2004, 79 such cases were put up to Air HQ for aeromedical decision. These belonged to 69 flight crew. Of these, 36 were put up for confirmation of awarded permanent medical unfitness. In 11 cases, the medical assessor disagreed with the opinion of the AMEs/ AMCs and these were put up for amendment of fitness/ unfitness or limitation status. 22 cases were those who had appealed against the decision of an AMC. Of the 22 appeal cases, 11 were granted fitness (with or without limitation) on review, 8 were re-confirmed as unfit on review and in 3 cases the appeals were rejected for lack of supporting medical evidence. A system-wise breakdown of the cases revealed that 58 cases were for medical/ surgical conditions, among which the leading contributors were Coronary Artery Disease (CAD) (n=14), EEG abnormality (n=11), Diabetes Mellitus/ IGT/ IFG (n=8) and 3 cases each of major psychiatric disorders and Essential Hypertension. Among ophthalmologic cases, there were 3 cases of substandard colour perception and 2 cases each of high myopia and squint. Perusal of these cases reveals interesting trends and observations. The paper discusses the need for better dissemination of medical policies to Class II AMEs. The requirement of EEG for initial issue of Class I medical examination is reviewed. Standardisation of medical assessment at various AMCs is re-emphasised.

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The Director General Medical Services of the Indian Air Force, [DGMS (Air)] is the Medical Advisor to the Director General of Civil Aviation (DGCA). On behalf of DGMS (Air), the Joint Director Medical Services (Civil Aviation) [JDMS (CA)] works as the medical assessor at DGCA. Records of medical examinations conducted for all civil aircrew of the country are scrutinised by the JDMS (CA) at DGCA. The JDMS (CA) approves routine cases. After scrutiny, certain cases are put up to senior specialists in Aviation Medicine at Air HQ on an established channel, as deemed necessary.

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All the instances in which the medical records are put up to senior functionaries at Air Headquarters require aeromedical decision-making. At the time of making such a decision, the experts have to keep in mind the implications on Flight Safety as well as on the career of the concerned individual. Annex 1 of ICAO Standards and Recommended Practices is used as the guiding document for such decision-making. The ICAO Manual of Civil Aviation Medicine, though of 1985 vintage, provides good reference and guidelines. Relevant Aeronautical Information Circulars (AICs)/ Civil Aviation Regulations (CARs) and Medical Information Circulars (MICs) issued from DGCA/ DGMS (Air) are referred to as required. Similarly, medical policies of Joint Aviation Requirements (JAR) of the European Union and Federal Aviation Administration (FAA) of USA are also referred to.

The decision is based on the considered opinion of the experts in light of the available guidelines and best practices followed worldwide. Experience of the concerned flight crew is given due consideration before arriving at a decision.

At times the flight crew are required to be subjected to a review by a leading medical expert in the relevant speciality. On other occasions flight crew may be asked to bring in an 'Executive Report' by a senior pilot/ instructor. The final decision arrived at is endorsed on the medical document of the flight crew and communicated to him/her by the office of the DGCA.This study was conducted to analyse the prevailing system of aeromedical decision-making for civil flight crew in India.

Material and Methods

All instances of civil flight crew requiring aeromedical decision-making at the office of DGMS (Air) during the period Jan 2001 to Aug 2004 were scrutinised. These included all cases of permanent unfitness for flying, appeal cases and cases wherein the medical assessor at DGCA disagreed with the opinion of the AMC or AME.

The case details were studied from the existing records held at Air HQ and where required, the Previous Medical Records (PMRs) of the concerned flight crew were referred to at DGCA. The cases were classified system wise and further as per diagnoses. Aeromedical decision-making for specific cases was compared to aeromedical disposals awarded by JAR and FAA for similar disabilities.

Results

During the period of study a total of 19,609 Class I and 2405 Class II medical examination records were scrutinised by the medical assessor at DGCA. For all ALTP licence holders as well as for CPL holders above age 40 years, medical examinations are conducted once every six months. On an average, for such flight crew, there would have been seven medical examinations during the period of study. For the private pilot licence holders the frequency of medical examinations required is once every two years below the age of 40 years. Many such pilots choose not to get the renewal medical examination conducted when they are not exercising the privileges of there licence. The total number of 'active' commercial flight crew (those who get medical examinations conducted regularly and therefore possess valid licences) at a given point of time cannot be accurately ascertained. During the period of study this could be worked out roughly, based on the number of medical examinations done. Number of commercial flight crew was estimated to be 4000 and for private pilots this

figure was approximately 2000. Medical records of 69 flight crew (1.15% of approximately 6000 'active' flight crew in India) were considered for aeromedical decision-making during the period studied. Records of some flight crew were put up more than once at varying intervals. Of these, the breakdown for referrals to DGMS (Air) was as under:-

(a) Approval of permanent unfitness - 36

(b) Modification of disposal given by AMCs/ AMEs - 11

(c) Appeal by flight crew against medical assessment by AMCs/AMEs - 22

Of the 22 appeal cases, 11 were granted fitness on review (with or without limitations), 8 cases were re-confirmed as unfit on review and in 3 cases the appeals were rejected for lack of supporting evidence/ opinions.

System-wise breakdown of these cases was as under:-

(a) Medical / Surgical	-	58
(b) Ophthalmologic	-	9
(c) ENT	-	2

Among the medical and surgical cases, the largest number were CAD (n=14), EEG abnormality (n=11), Diabetes Mellitus/ IFG/ IGT (n=8) and 3 cases each of major psychiatric disorders and Essential Hypertension. Among the ophthalmologic cases were 3 cases of substandard colour perception and 2 cases each of high myopia and squint. CSOM and substandard hearing contributed one each case. Salient features of the two major categories are discussed in the subsequent paragraphs.

Coronary Artery Disease. Among the 14 cases of CAD, there were three cases of CAD detected by Class II AMEs from among the private pilots during this period. These included one case of CAD-CABGS done, another case of significant CAD proven on CART and a third pilot diagnosed as ?CAD after Exercise ECG and Stress Thallium studies. Interestingly, all the three cases were examined and assessed as fit by senior doctors with considerable experience in aviation related duties. The flight crew had not undergone a recent CART in any of the three cases. The aeromedical examiners had, however, recorded details of the disease and current status on the medical examination form CA-34A. Theirs was a considered opinion on the fitness of the flight crew, which in the absence of a recent coronary angiography, was not acceptable to the medical assessor. Grant of medical fitness to all three flight crew was therefore withheld.

EEG abnormalities. There were 11 cases of EEG abnormality in this study. Of these, 10 cases were confirmed as permanently unfit to fly due to EEG abnormality. Two cases of EEG abnormality merit discussion. One case was a 19-year-old girl who was initially confirmed as 'permanently unfit to fly' on the basis of an EEG recorded at a corporate hospital on 25 Jun 03, that revealed paroxysmal synchronous bursts of 5.5 to 6 Hz, slow sharp wave discharges over both hemispheres during wakefulness. This activity incremented during hyperventilation to a considerable degree and in addition was superimposed by 3.5 to 4 Hz slow wave discharges. Psychiatrist at AMC endorsed this EEG report as 'Abnormal'. The assessment of permanent unfitness was approved at Air HQ on 18 Jul 03. An initial appeal by this girl was rejected at DGCA itself on 26 Aug 03. In October 2003, she appealed again, supported by opinions of two leading neurophysicians, based on fresh EEGs.

Her fresh appeal for a review was upheld and she was reviewed at the second AMC in Dec 2003. On the basis of the opinion of Senior Advisor Neurology, Army Hospital Research & Referral, wherein he opined on the old (initial) EEG of 25 Jun 03 as well as fresh EEG, she was declared fit for flying and this was approved at Air HQ in Jan 04. While commenting on the old EEG, the Senior Advisor noted that "(The EEG)… shows normal rhythmical waves of 4-5 Hz and vertex sharp waves which are normal. Hyperventilation response has been good in this case. Generalised slow waves in hyperventilation. No spike or sharp waves/ epileptiform discharges seen…In my opinion this candidate is fit for flying as far as EEG is concerned".

The second case was that of an 18-year-old boy examined at an AMC on 23 Jul 04 and given final disposal in absentia on 27 Jul 04. EEG was described as "Abnormal EEG – Generalised epileptiform discharges". The Psychiatrist at the AMC ordered a sleep-deprived EEG. During the procedure on 26 Jul 04, the individual had a generalised seizure, which has been recorded on EEG. This individual was diagnosed as Generalised Epilepsy – Myoclonic. The permanent unfitness was approved at Air HQ on 11 Aug 04.

Discussion

Aeromedical decisions must be based on factual, objective information and documentation and not an emotional sense of obligation to the individual. The foremost obligation is to aviation safety. It is to the ultimate benefit of the pilot for the physician to maintain and promote aviation safety [1]. Adequate information regarding incapacitation risk is now available for some of the common medical conditions. This permits a reasonably objective decision-making for such conditions. It could be argued that a high quality aeromedical decision is reasonable, replicable and reviewable [2]. Watson has suggested an evidence-based risk management approach where various types of medical research studies are given a graded importance depending on the nature of study e.g. a cohort study being superior to a case-control study [2]. One of the problems in the application of evidence-based risk management approach to aeromedical decision- making is paucity of quality medical evidence suitable for aeromedical application [2]. This is especially true for Indian population and even more so for representative Indian population, such as Indian flight crew.

The 1% rule applicable for multi-crew operations allows for an incapacitation rate of one in 10^6 hours or approximately 1% per annum [3]. The 1% rule has, however, several limitations. Some feel it is too restrictive, whereas others feel that it caters only to cardiovascular mortality/ incapacitation. There are others who argue that medical incapacitation risk, particularly cardiovascular risk may be over-regulated when compared with another vital aircraft system, the power plant. They recommend a figure of 2% per annum as a more appropriate acceptable risk of incapacitation [4]. The British population crosses the 1% per annum risk of incapacitation due to CAD on reaching age 65 years [3]. Although neither ICAO nor JAR [5] give blanket permission for commercial flight crew beyond age 60, UK has filed a difference with ICAO in this regard. For Indians including aircrew, there are definite indications that CAD is affecting younger individuals as compared to Caucasians [6].

In the Indian population, incapacitation risks are not documented for a large number of diseases and disabilities. It is therefore, virtually

impossible to apply the 1% rule to judge medical fitness for an individual flight crew. In such a scenario, aeromedical decision-making is definitely subjective to an extent. The experts are required to give the rational basis of their opinion/ decision, based on the inputs from current medical literature and best practices followed in other countries. These written opinions and decisions help to serve as guidelines for similar cases in future, until there is definite evidence to change the same.

Flight crew who appealed against the decision of unfitness by the AMC were invariably referred to the other major centre for review, provided supporting evidence of improvement in status was available. The large percentage (50%) of cases in which fitness was granted after appeal was because in most cases the flight crew with disabilities waited for improvement with treatment/ surgery before obtaining specialists' opinion and appealing for review. In cases of revascularisation procedures, minimum time periods for consideration of fitness are laid down and these were always adhered to.

Coronary Artery Disease. Coronary angiography (CART) remains the mainstay of investigation for evaluating flight crew after revascularisation procedures. Flight crew, who are unwilling to be subjected to a check angiography after the laid down periods of revascularisation procedures, cannot be considered for flying fitness. This requirement is unequivocal in all countries for all flight crew and is followed scrupulously. In India, at present medical standards for cases of CAD are same for Class I and II medicals. Flight crew cannot be considered for fitness after being diagnosed as significant CAD unless they have had successful revascularisation done followed by a period of unfitness. A repeat CART is, inter alia, essential prior to an assessment of fitness. Most regulatory authorities including JAR qualify the medical fitness in such cases with a limitation "as or with co-pilot" for Class I licences, but do not impose limitations for Class II pilots [5]. In our opinion, the rationale for viewing Class II pilots more leniently in this respect cannot be fully justified. In the absence of a qualified co-pilot, the 1% rule does not apply for these cases. For a single-pilot, the incapacitation risk leading to likelihood of an accident would be 100 times higher and hence unacceptable.

A study on CAD among civil aircrew in India by the authors had revealed that we were the only nation permitting return to flying fitness without limitations post-cardiac revascularisation procedures, after an observation period of three years [6]. Permitting flight crew to exercise privileges of licence without limitations would enable such flight crew to fly without qualified co-pilots and possibly with ab-initio trainee pilots. This would again compromise the 1% rule in the non-availability of redundancy provided by a qualified and experienced co-pilot. The practice of awarding a 'no limitations' status has since been stopped and flight crew with CAD after a revascularisation procedure can now be assessed as either "fit to fly as co-pilot only" or "fit to fly as pilot-in-command along with qualified experienced pilot only". This applies to both Class I and Class II medical assessments. Since most private pilots can operate aircraft with less than 1500 kg all up weight without the requirement of a qualified co-pilot on board, medical limitations on such pilots may preclude opportunities to operate such aircraft. It is however, proposed to continue with these limitations for all pilots in the interest of flight safety.

It is imperative that all Class II AMEs are

well versed with existing policies on disposal of flight crew with disabilities. Recent amendments to existing policies and the rationale for such changes are sometimes not known to the Class II AMEs. There is therefore a definite need to formalise a requirement for all Class II AMEs to attend regular updates/ CME programmes in Aviation Medicine. Enforcing such a requirement for all aeromedical examiners may be desirable.

EEG abnormalities. Electroencephalography as a screening test for pilot-aspirants is a debatable issue. A normal EEG is no guarantee that epilepsy has not occurred, is not occurring or will not occur in the future [7]. EEG is not a mandatory requirement for evaluation of pilots in the Medical Provisions for Licensing by ICAO [8]. The FAA also does not require a mandatory EEG for any class of flight crew.

The JAR requires an EEG for initial medical examination of Class I flight crew and when indicated by the applicant's history or on clinical grounds [5]. In India, EEGs for initial issue of Class I medical examinations have been conducted since 1991 [9]. The requirement for EEGs in military aircrew in IAF has been reviewed in 2003. Routine EEG of candidates for aircrew duties is now required only if there is history of epilepsy in the family, past history of seizures or head injury and/ or any other neurological or psychological abnormality noted in the past. Routine EEG screening however, continues to be mandatory for all fighter pilots [10]. The Netherlands Aeromedical Institute calculated the probability that a candidate with epileptiform EEG but no history of epileptic seizures, will develop seizures during his flying career to be about 25%, more than 12 times higher than for subjects with normal EEG and no history of epileptic seizures (2%). Epileptiform EEG discharges may be associated with episodic functional impairment, which can be a danger when a subject is flying [11]. However, a 10-15 year follow up of 14 USAF Academy cadets who were classified as having abnormal EEG during 1965-69 revealed that none of these subjects developed a seizure disorder [12].

It is important to have in place a system that ensures fairness and accuracy in interpretation of EEGs. Opinion based on EEG information is only valid if provided by those clinically experienced in the field and both prepared and able to justify their advice [7]. The current system of EEG interpretation is working reasonably well in India, though a need is felt to formalise the appellate review of EEGs by a medical board of three experienced specialists in the field. It is known that opinions on abnormalities in EEGs can differ widely amongst specialists. Since flight safety and career prospects of budding pilots are at stake in this delicate issue, it is felt that decisions on justifiable appeals should be taken after obtaining advice from such a board.

Conclusion

Aeromedical decision-making for other than routine cases of civil flight crew is undertaken at the office of the DGMS (Air). Quantification of risk of incapacitation, although desirable, is not found practical in assessing the variety of cases considered for fitness for flying duties. Of the 69 cases reviewed during 2001 to 2004, the largest numbers were due to CAD and abnormal EEGs. A fresh CART before award of flying fitness to flight crew with proven CAD is of paramount importance, apart from the other non-invasive investigations to assess the same. There appears to be little justification in permitting flying status without any limitations for Class II pilots with CAD. Standards for both Class I and II pilots with CAD remain the same in India. It is essential to evolve a system whereby all AMEs are made aware of

changes in policy with regard to aeromedical disposals as well as the rationale for the same. A formally constituted specialist board comprising of three experts is recommended for review of all appellate cases of EEG abnormality.

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