Temporary Incapacitation Rates and Permanent Loss of Medical License in Commercial Airline Pilots

Erik Hohmann

FRCS (Tr&Orth), PhD, MD

Burjeel Hospital for Advanced Surgery, Dubai, United Arab Emirates; School of Medicine, University of Pretoria, South Africa

E-Mail: dr.erik@burjeelspecialty.com

Reino Pieterse

MBChB, MSc (Sports Medicine)

Clinical Lead Emirates Group Rehabilitation Unit.

E-Mail: doc.reino@emirates.com

Corresponding Author

Erik Hohmann, School of Medicine, Faculty of Health Sciences, University of Pretoria, Cnr Bophelo and Dr Savage Road, Gezina, Pretoria, 0001, South Africa

E-Mail: dr.erik@burjeelspecialty.com

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Abstract

Introduction:

The purpose of this study was to report the temporary loss of medical license and pilot incapacitations in the United Arab Emirates from 2018-2021.

Method:

The General Civil Aviation Authority database was searched for all reported temporary suspensions of license between 2018-2021 and the ICD-10 codes were extracted.

Results:

A total of 1233 incapacitations was reported with a mean license suspension of 148.4±276.8 days. The mean days of suspension for the various medical specialties were 115.2±188.4 for musculoskeletal conditions (n=392), 189.3±324.8 for medicine (n=335), 101.6±231.4 for surgery, 109.4±223.5 for urology (n=93), 90.3±128.7 for ophthalmology (n=68), 385.6±594.3 for psychiatry (n=61, 150.4+285.9 for ENT (n=59), 419.4±382.6 for obstetrics and gynaecology (n=30) and 44.9+39 for dermatology (n=21). Permanent suspensions were as follows: total n=100 (8.1%); musculoskeletal n=13 (3.3%); medicine n=37 (11%); surgery n=10 (5.7%); urology n=10 (10.7%); ophthalmology n=2 (2.9%); psychiatry n=20 (32.8%); ENT n=1 (1.7%); obstetrics and gynaecology n=4 (13.1%); dermatology n=3 (14.3%).

Discussion:

Musculoskeletal conditions are the most common reason for temporary loss of medical license followed by medical and surgical conditions. The least common reason was dermatological conditions. The longest period of incapacitation was associated with psychiatric conditions followed by medical and ENT conditions. The annual calculated temporary incapacitation rate was 2.8% and the permanent suspension rate was 0.25%.

Key words:

Return to work; pilots; temporary medical license suspension; occupational health

Introduction

Work and working conditions have a profound effect on an individual's health. [2] Perceived job insecurity, physical exposures to dangerous conditions, but also rotating shift work can result in mental and physical conditions and deteriorating health. [2] For example, shift-work and long work hours have the potential to increase the risk of injury and obesity and result in a wide range of chronic diseases. [5] In long-haul truck drivers the risk for cardiovascular and metabolic disease was 3.7 times, respectively 4.31 higher when compared to the National Health and Nutrition Examination Survey sample of the general U.S population. [14,22]

Airline pilots work in similar conditions which involve shift-work, circadian rhythm disturbances with exposure to mild hypoxia, reduced atmospheric pressure, low humidity, noise vibration and cosmic radiation. [3] Butler and Nicholas have performed a survey of more than 10,000 active and retired pilots in the United States and Canada and have reported that there is an increased risk of melanoma, motor neurone disease and cataracts. [3] However, the authors could not demonstrate an increased risk for other diseases such as heart disease, diabetes and high blood pressure when comparing their data to the 1995 National Health Interview Survey. [3] Evans and Radcliffe have reported annual incapacitation rates in commercial airline pilots and have shown that accidents, cardiovascular and musculoskeletal conditions were the most common reasons for temporary unfitness. [8] Parker and Snyder showed that 25% of airline pilot morbidity and long-term disability occurred because of cardiovascular reasons with no correlation to age followed by 11% for orthopaedic and musculoskeletal conditions. [8] Long-term disability rates in a cohort of 2271 Canadian pilots were recorded between 1981 and 1990. [1,22] The main reason for a long duration of leave of absence were mental disorders (16%) circulatory (14%) and digestive (12%) system diseases and musculoskeletal conditions (11%). [1,22] Currently there is insufficient updated information

on medical conditions resulting in temporary loss of medical license and incapacitation. The purpose of this study was to therefore report the temporary loss of medical license and pilot incapacitations in the United Arab Emirates (UAE) from 2018-2021.

Methods

This study utilized data from the database of the General Civil Aviation Authority (GCAA) and the following data was extracted by an aeromedical officer of the GCAA: date of license suspension and reinstatement, age, gender and ICD-10 codes. The data was then forwarded to the first author. The authors had no access to any other information, and this process effectively de-identified personal data. [4] In general, registry data studies are exempt from IRB approval and our study design is in compliance with the World Medical Association declaration of Helsinki ethical principles for medical research amended by the 64th WMA General Assembly in 2013. [19] Admittedly, the available research data could be de-identified but the likelihood of unauthorized access to the GCAA database by a non GCAA employee is not possible.

The GCAA is the federal regulatory body of the United Arab Emirates overseeing all aviation related activities in the United Arab Emirates. The GCAA CAR MED regulations outline the medical provisions for licensing pilots and cabin crew. [12] If pilots were determined to be unfit, the responsible aviation medical examiner will upload a request for suspension of the medical license onto the GCAA website. [16] Once the report is uploaded onto the GCAA website, the license will be suspended with immediate effect. For medical conditions, a medical report will also be submitted to the GCAA which includes all applicable ICD-10 codes. Similar, for reinstatement of the aviation license, the responsible aviation medical physician will upload a request for reinstatement. This request again includes all applicable

ICD-10 codes, all applicable medical reports and detailed operation notes from the treating specialist. [16]

The following inclusion criteria were applied: license suspension for all pilots registered with the GCAA between January 2018 to October 2021, age between 18-65 years, availability of ICD-10 codes for all license suspensions. Pilots were excluded if they voluntarily suspended their license. If there was no date of reinstatement, pilots were considered to have lost their license permanently. Medical and surgical pathology was categorized according to the ICD-1—PCS system (ICD10Data.com) and the following categories were used: dermatology, ear-nose-throat (ENT), obstetrics and gynaecology, musculoskeletal, ophthalmology, psychiatry, surgical, urology.

Statistical analysis

Descriptive analysis was applied to demographic data. The mean, standard deviations, ranges and 95% confidence intervals for the time of pilot incapacitation was calculated for the total number of cases. The data was then subdivided into nine subspecialties: musculoskeletal, medicine, surgical, urology, ophthalmology, psychiatry, ENT, obstetrics and gynaecology and dermatology.

For the individual subspecialties similar pathology and ICD-10 codes were grouped and means and standard deviations were calculated. Pilots who did not return to work and had permanent license suspensions were excluded when calculating mean and standard deviation with subgroup pooling. All analyses were conducted using STATA SE for Windows (version 12.0; StataCorp, College Station, Texas, USA).

Results

Between January 2018 to October 202, a total of 1233 pilots was reported to the GCAA for medical incapacity and their license was temporarily suspended. The mean age was 46.4+10.4 years. There were 1173 male pilots with a mean age of 46.9+10.3 and 60 female pilots with a mean age of 37.1+7.7. The mean days of temporary suspension were 148.4+276.8 days ranging from 1-1257 days with a 95% confidence interval between 63-98.6 days. The largest number of pilot incapacitations were reported for musculoskeletal conditions and the lowest number were reported for dermatological conditions. The longest time of incapacitation was observed for pilots with psychiatric conditions and the shortest time was reported for pilots with dermatological conditions. One hundred pilots did not return to work. Table 1 summarizes the period of incapacitation for the study period (Table 1).

Table 1: Period of Temporary Incapacitation for Pilots

	N	**Mean Days**	**STDEV**	**Range**	**95% CI**	Did Not Return
Muskuloskeletal	392	115.2	188.4	2-1446	96.3-134.2	13
Medicine	335	189.3	324.8	58-2170	151.7-226.9	37
Surgical	174	101.6	231.4	1-2025	64.9-138.4	10
Urology	93	109.4	223.5	2-1268	27.8-131.5	10
Ophtalmology	68	90.3	128.7	2-719	58.6-121.9	2
Psychiatry	61	385.6	594.3	6-2757	195.5-575.6	20
ENT	59	150.4	285.9	1-1727	75.3-225.6	1
Obstetrics/Gynaecology	30	419.4	382.6	5-1390	268-572.7	4
Dermatology	21	44.9	39.6	9-162	25.2-64.6	3
Total	**1233**	**148.4**	**276.8**	**1-2757**	**63.0-98.6**	**100**

Table 2: Period of Temporary Incapacitation for Pilots – Musculoskeletal

	N	Mean Days and SD of License Suspension	Did Not Return
Foot and Ankle			
Metatarsal Fracture	13	73.1+50.9	0
Ankle Fracture	12	64.9+54.4	1
Ankle Sprain	4	35.2+13.4	0
Tarsal Fracture	4	73.2+64.1	0
Achilles Tendon Tear	3	215+171.4	0
Syndesmosis Injury	3	22+16.6	0
Calcaneus Fracture	2	34.5+16.3	0
Hallux Valgus	2	219+42.4	0
Bunion Surgery	1	11	0
Foot Contusion	1	444	0
Nailbed Injury	1	40	0
Osteoarthritis Ankle	1	DNR	1
Toe Fracture	1	17	0
Unspecified Foot Injury	1	44	0
Unspecified Sprain	1	43	0
Arm and Elbow			
Proximal Radius Fracture	9	40+23	0
Forearm Fracture	3	417.5+482	0
Humerus Fracture	2	91+21.2	2
Triceps Tendon Tear	2	94+82	
Elbow Dislocation	1	48	0
Olecranon Bursitis	1	65	0
Olecranon Fracture	1	76	0
Pain Elbow	1	3	0
Osteoarthritis Elbow	1	283	0
Hand and Wrist			
Metacarpal Fracture	16	68.1+79.8	0
Distal Radius Fracture	11	54.5+22.8	0
Carpal Bone Fracture	9	180.1+254.2	0
Phalanx Fracture	7	49.1+24.3	0
Phalanx Dislocation	4	94+86.1	0
Crush Injury Finger	3	75+36.6	0
Nail Bed Injury	3	59.6+22	0
Tenosynovitis	3	239+286.9	0
Thumb Fracture	3	20.7+37.6	0
Carpal Dislocation	2	50+14.1	0
Dupuytren Disease	2	26.5+23.3	0
Hand Fracture	2	27+29.7	0
Non-specified Wrist Injury	2	43.5+4.9	0
Ganglion Wrist	1	24	0
Hand Ligament Tear	1	174	0
Mallett Fracture	1	41	0
Trigger Finger	1	12	0
Wrist Pain	1	21	0
Other			
Removal of Hardware	2	17	1
Osteochondrosis	1	300	0
Other Bone Disorder	1	113	1
Hip			

Osteoarthritis	5	133.8+148.1	0
Total Joint Replacement	3	108+123.1	0
Pelvic Fracture	2	1385	1
Hip Dislocation	1	49	0
Hip Pain	1	93	0
Impingement	1	960	0
Knee			
Meniscus Injury	39	56.8+65	0
Anterior Cruciate Ligament Injury	10	134+92.7	0
Pain	6	174.7+224.3	0
Osteoarthritis	3	232.7+285.5	0
Multi-ligament Injury	2	81+7.1	0
Osteochondritis Dissecans	2	43	1
Effusion	1	28	0
Joint Pain	1	DNR	1
Patella Disorder	1	100	0
Patella Tendinitis	1	24	0
Posterior Cruciate Ligament	1	191	0
Pre-patella Bursitis	1	104	0
Total Joint Replacement	1	33	0
Lower Extremity			
Tibial Shaft Fracture	7	137.6+164.7	0
Tibial Plateau Fracture	6	104.5+43.5	0
Femur Fracture	4	463+267.5	0
Stress Fracture	4	80.2+10.1	0
Muscle Tear	2	14.5+9.2	0
Osteoarthritis	2	82.5+2.1	0
Other Leg Fracture	2	216.5+280.7	0
Surgical Complications	1	147	0
Shoulder			
Impingement	19	121.1+246.2	0
Clavicle Fracture	13	62+64.7	0
Proximal Humerus Fracture	9	59.1+41.7	0
Rotator Cuff Tear	7	296.4+507.2	0
SLAP Lesion	7	68.7+33.3	0
Dislocation	6	121.7+167.6	0
ACJ Dislocation	4	113.5+128.3	0
Calcific Tendinitis	2	219+260.2	0
Bone Cyst Humerus	1	67	0
Other	1	92	0
Scapula Fracture	1	22	0
Spine			
Lumbar Spine Disc Prolapse	23	184.5+239.9	0
Low Back Pain	12	173.2+253.7	1
Cervical Radiculopathy	7	54.7+40.8	0
Cervical Myelopathy	6	179.8+155.8	1
Lumbar Spine Fracture	5	152.5+161.3	1
Cervical Disc Prolapse	2	54+11.3	0
Sciatica	2	22.5+9.2	0
Thoracic Spine Pain	2	705+865.5	0
Ankylosing Spondylitis	1	70	0
Cervical Disk Replacement	1	57	0
Lumbar Spine Radiculopathy	1	47	0

Sacroiliitis	1	25	0
Spondylolisthesis	1	76	0
Torticollis	1	DNR	1
Total	**392**		**13**

Musculoskeletal

There was a total of 392 pilots with medical conditions (Table 2). The mean age was 46.2+9.3 years. There were 383 males with a mean age of 46.2+9.4 and nine females with a mean age of 47.6+7 years. The most common conditions were meniscus injuries (n=39 with a mean suspension of 56.8 days), lumbar spine disc prolapse (n=23 with a mean suspension of 184.5 days), and shoulder impingement (n=19 with a mean suspension of 121.1 days). However, the most common reason for suspension was orthopaedic trauma with a total of 131 cases. The mean time of suspension was 115.2+188.4 days. Thirteen pilots did not return to work. The reasons were related to fractures in six cases, spinal conditions in three cases, osteoarthritic and other degenerative conditions in four cases.

Medicine

There was a total of 335 pilots with medical conditions (Table 3). The mean age was 49.5+9.7 years. There were 333 males with a mean age of 49.6+9.7 and two females with a mean age of 39.5+4.9 years. The most common conditions were hypertension (n=60 with a mean suspension of 101.6 days), sleep apnoea (n=28 with a mean suspension of 173 days), angina (n=27 with a mean suspension of 217.5 days), diabetes mellitus (n=26 with a mean suspension of 116.9 days) and arrythmias (n=26 with a mean suspension of 170.6 days). The mean time of suspension was 189.3+324.8 days. Thirty-seven pilots did not return to work. The reasons were related to cardiac conditions in ten cases, pulmonological conditions in four cases, gastroenterological conditions in two cases, neurological conditions in nine cases,

infectious conditions in one case (Malaria), malignancies in seven cases, and endocrinological conditions in two cases.

Table 3: Period of Temporary Incapacitation for Pilots – Medicine

	N	Mean Days and SD of License Suspension	Did Not Return
Cardiology			
Hypertension	60	101.6+222.4	1
Angina	27	217.5+349.9	2
Arrythmia	26	170.6+189.4	1
Syncope	14	232.6+253	2
Myocardial Infarction	4	207.5+61.5	2
Atrial Septal Defect	3	451.5+453.2	1
Intracardiac Thrombosis	3	148+123.2	0
Atrial Fibrillation	2	442.5+458.9	0
Cardiac Stenting	2	516.5+338.7	0
Unstable Angina	2	641.5+649.8	0
Abnormal Cardiovascular Function	1	DNR	1
AV Malformation	1	127	0
Cardiac Valve Disorder	1	DNR	1
Ischaemic Heart Disease	1	218	0
Pulmonology			
Sleep Apnoea	28	173+428.3	1
Pulmonary Embolus	8	138.2+52.8	2
Covid	7	26.6+33.5	0
Upper Respiratory Infection	3	22.7+11.7	0
Asthma	2	43+7.1	0
Pneumothorax	2	45+7.1	0
Abnormalities of Breathing	1	DNR	1
Cough	1	66	0
Other Lung Disorders	1	415	0
Pleuritis	1	DNR	0
Pneumonia	1	2170	0
Shortness of Breath	1	751	0
Gastroenterology			
Crohn's Disease	5	112.4+65.1	0
Ulcerative Colitis	3	87+54.3	0
Abnormal Liver Function	2	56	1
Acute Pancreatitis	2	9+5.65	0
Gastritis	2	151+188.1	0
Irritable Bowel Syndrome	2	303.5+33.2	0
Reflux	2	159.5+166.2	0
Diarrhea	1	783	0
Nausea/Vomiting	1	DNR	1
Pyloric Stenosis	1	20	0
Neurology			
Dizziness	9	156.1+145.1	1
Migraine	3	164	2
TIA	3	271	2
Cognitive Impairment	2	259	1

Bells Palsy	1	DNR	1
Brain Disorder Unspecified	1	548	0
Caisson's Disease	1	53	0
Dementia	1	15	0
Headaches	1	DNR	1
Multiple Sclerosis	1	281	0
Parkinson	1	517	0
Pituitary Adenoma	1	334	0
Stroke	1	DNR	1
Trigeminal Neuralgia	1	869	0
Infections			
Amoebiasis	2	16.5+4.11	0
Unclear Fever	2	36+12.7	0
Fever Unknown Origin	1	23	0
Leishmania	1	28	0
Lyme Disease	1	803	0
Malaria	1	1354	1
Mononucleosis	1	46	0
Syphilis	1	1	0
Tuberculosis	1	245	0
Oncology			
Colon Cancer	4	580	3
Lymphoma	3	22+29.7	1
Leukemia	2	614+796.2	0
Benign Myocardial Neoplasm	1	2167	0
Esophagus Cancer	1	DNR	1
Hodgkins Lymphoma	1	DNR	1
Lung Cancer	1	DNR	1
Endocrinology/Rheumatology			
Diabetes	26	116.9+208.9	1
Thyrotoxicosis	6	122.3+128.8	0
Iron Deficiency	5	83+134.8	0
Gout	3	47.5+26.2	1
Hypothyroidism	3	77+124.7	0
Inflammatory Arthropathy	3	257.7+289.8	0
Rheumatoid Arthritis	2	53.5+45.9	0
Enteropathic Arthropathy	1	830	0
Hashimotos	1	13	0
Osteoporosis	1	20	0
Vitamin Deficiency	1	281	0
Nephrology			
Kidney Failure	3	191.3+145.8	0
Proteinuria	1	22	0
Other			
Thrombocytopenia	2	79+2.8	0
Deep Vein Thrombosis	1	340	0
Unspecified	1	DNR	1
Total	**335**		**37**

Table 4: Period of Temporary Incapacitation for Pilots – Surgery

	N	Mean Days and SD of License Suspension	Did Not Return
Hernia Inguinal	53	48.4+95.4	1
Appendicitis	24	35.8+77.9	2
Cholecystitis	17	120.1+200.2	1
Haemorrhoids	12	202.7+350.2	0
Hernia Umbilical	12	56.6+95.4	0
Anal Fistula	5	86+83.9	0
Diverticultis	4	64.5+56.4	0
Pilonidal Sinus	4	35.7+28.3	1
Post Surgical Procedure	4	24.7+12.9	0
Rib Fracture	4	99.2+112.8	0
Thyroid Surgery	4	734.3+1119.6	1
Head Injury	3	247+189.7	0
Phlebitis	3	52.7+26.4	0
Aspiration for Complication	2	133+63.3	0
Concussion	2	28	1
Anal Cancer	1	26	0
Aortic Aneursym	1	DNR	1
Bariatric Surgery	1	DNR	1
Breast Hypertrophy	1	8	0
Cellulitis	1	76	0
Complication from Procedure	1	13	0
Disease Intestine	1	55	0
Dog Bite	1	24	0
Hernia Diaphragmatic	1	50	0
Intussusception	1	18	0
Mandible Fracture	1	42	0
Necrotizing Fasciitis	1	1002	0
Neoplasm Aortic Body	1	204	0
Obesity	1	455	0
Occipital Condyle Fracture	1	92	0
Post GIT Surgery	1	574	0
Post Procedure Hypothyroidism	1	41	0
Right Quadrant Pain	1	7	0
Scalp Laceration	1	7	0
Stricture of Artery	1	DNR	1
Varicose Veins	1	4	0
Total	**174**		**10**

Surgery

There was a total of 174 pilots with surgical conditions (Table IV). The mean age was 45.3+9.8 years. There were 171 males with a mean age of 45.5+9.7 and three females with a mean age of 32.7+5.8 years. The most common conditions were inguinal hernia (n=53 with a mean suspension of 48.4 days), appendicitis (n=24 with a mean suspension of 35.8 days) and cholecystitis (n=17 with a mean suspension of 120.1 days). The mean time of suspension was

101.6+231.4 days. Ten pilots did not return to work. Two pilots did not return following appendicitis surgery and one pilot each for the following conditions, aortic aneurysm, concussion, bariatric surgery, following surgery for cholecystitis, following surgery for inguinal hernia, pilonidal sinus, stricture of artery and following thyroid surgery.

Urology

There was a total of 93 pilots with urological conditions (Table V). The mean age was 46.8+10.5 years. There were 90 males with a mean age of 47.1+10.6 and three females with a mean age of 37.7+3.1 years. The most common conditions were kidney stones (n=35 with a mean suspension of 96.6 days) and ureter stones (n=26 with a mean suspension of 99.5 days). The mean time of suspension was 109.4+223.5 days. Ten pilots did not return to work. Five pilots were diagnosed with prostate cancer, two pilots with bladder cancer, one pilot with kidney cancer, one pilot with testicular cancer and one patient following ureter stones.

Table 5: Period of Temporary Incapacitation for Pilots – Urology

	N	**Mean Days and SD of License Suspension**	**Did Not Return**
Kidney Stones	35	96.6+183.7	0
Ureter Stones	26	99.5+216.8	1
Prostate Cancer	7	69+29.7	5
Renal Colic	6	155.7+214.7	0
Bladder Disorder	3	203.7+320.8	0
Bladder Cancer	2	DNR	2
Circumcision	2	18+4.2	0
Haematuria	2	24.5+3.5	0
Prostate Hypertrophy	2	28+29.7	0
Testes Disorder	2	17+4.2	0
Kidney Cancer	1	DNR	1
Other Renal Disorder	1	1268	0
Scrotal Varices	1	42	0
Testicular Cancer	1	DNR	1
Urethral Stricture	1	70	0
Urine Retention	1	58	0
Total	**93**		**10**

Opthalmology

There was a total of 68 pilots with ophtalmological conditions (Table VI). The mean age was 44.8+13.2 years. There were 67 males with a mean age of 45.1+13.1 and one female aged 23 years. The most common conditions were cataract surgery (n=14 with a mean suspension of 136 days) and retina disorders (n=14 with a mean suspension of 106.6 days). The mean time of suspension was 90.3+128.7 days. Two pilots did not return to work; one following cataract surgery and one diagnosed with glaucoma.

Table 6: Period of Temporary Incapacitation for Pilots – Ophthalmology

	N	Mean Days and SD of License Suspension	Did Not Return
Cataract	14	136+207.5	1
Retina Disorder	14	106.6+151.3	0
Myopia	9	45.7+25.3	0
Visual Disorder	5	96+37.9	0
Keratokonus	4	86.7+19.6	0
Chorioretinopathy	3	135.7+97	0
Refractive Disorder	3	47.6+1.5	0
Conjunctivitis	2	27+26.9	0
Pterygium	2	23+5.6	0
6th Nerve Palsy	1	509	0
Diplopia	1	122	0
Glaucoma	1	DNR	1
Irregular Eye Movement	1	9	0
Keratitis	1	74	0
Lens Implant	1	73	0
Low Vision	1	32	0
Oculomotor Nerve Injury	1	8	0
Orbital Floor Fracture	1	50	0
Panuveitis	1	49	0
Viral Infection	1	63	0
Vitreoretinal Disorder	1	69	0
Total	**68**		**2**

Psychiatry

There was a total of 61 pilots with psychiatric conditions (Table VII). The mean age was 42.3+11.7 years. There were 55 males with a mean age of 43.3+11.6 and six females with a mean age of 32.8+8.6 years. The most common conditions were anxiety (n=29 with a mean suspension of 276.8 days) and alcohol related causes (n=10 with a mean suspension of 493.5

days). The mean time of suspension was 385.6+594.3 days. Twenty pilots did not return to work. The most common reasons were anxiety (n=8), depression (n=4) and alcohol related causes (n=3).

Table 7: Period of Temporary Incapacitation for Pilots – Psychiatry

	N	Mean Days and SD of License Suspension	Did Not Return
Anxiety	29	276.8+333.3	8
Alcohol	10	493.5+1108.9	3
Depression	8	832+988.9	4
Stress	6	537+528.9	1
Counselling	5	170.7+90	2
ADHD	1	DNR	1
Bipolar Disorder	1	DNR	1
Strange Behaviour	1	296	0
Total	**61**		**20**

Ear Nose and Throat (ENT)

There was a total of 59 pilots with ENT conditions (Table VIII). The mean age was 44.1+12.1 years. There were 56 males with a mean age of 47+12.1 and three females with a mean age of 34.7+11.5 years. The most common conditions were sinusitis (n=15 with a mean suspension of 41.8 days) and vertigo (n=12 with a mean suspension of 135.1days). The mean time of suspension was 150.4+285.9 days. One pilot did not return to work; he was diagnosed with an acoustic neuroma.

Obstetrics and Gynaecology

There was a total of 30 female pilots with obstetric and gynaecological conditions (Table IX). The mean age was 36.2+4.9 years. The most common condition was pregnancy (n=27 with a mean suspension of 356.7 days) The mean time of suspension was 419.4+382.6 days. Four pilots did not return to work; all were pregnant.

Table 8: Period of Temporary Incapacitation for Pilots – ENT

	N	Mean Days and SD of License Suspension	Did Not Return
Sinusitis	15	41.8+61.4	0
Vertigo	12	135.1+152.5	0
Eustachian Tube Disorder	4	10.2+3.6	0
Sinus Polyps	4	15.5+9.9	0
Sudden Hearing Loss	4	524.25+814.7	0
Vestibular Neuritis	3	533.7+325.3	0
Acustic Neuroma	2	276	1
Hypertrophic Nasal Turbinates	2	17.5+6.4	0
Maxillary Sinusitis	2	306+490.7	0
Other Nasal Disorders	2	20+12.6	0
Cholesteatoma	1	46	0
Condition of Glottis	1	486	0
Condition of Hard Palate	1	297	0
Condition of Larynx	1	80	0
Menieres' Disease	1	564	0
Otitis Media	1	2	0
Benign Salivary Gland Tumour	1	16	0
Tonsillitis (Acute)	1	7	0
Tonsillitis (Chronic)	1	7	0
Total	**59**		**1**

Table 9: Period of Temporary Incapacitation for Pilots – Obstetrics and Gynaecology

	N	Mean Days and SD of License Suspension	Did Not Return
Pregnancy	27	356.7+497.2	4
Endometriosis	1	14	0
Salpingitis	1	5	0
Uterus Myoma	1	9	0
Total	**30**		**4**

Dermatology

There was a total of 21 pilots with dermatological conditions (Table X). The mean age was 46.3+10.6 years. There were 20 males with a mean age of 47+10.5 and one female aged 34 years. The most common conditions were melanoma (n=10) and psoriasis (n=2). The mean time of suspension was 44.9+39.6 days. Three pilots did not return to work; two were diagnosed with melanoma and one pilot had other causes (not specified in the database).

Table 10: Period of Temporary Incapacitation for Pilots – Dermatology

	N	Mean Days and SD of License Suspension	Did Not Return
Melanoma	10	43+50.6	2
Psoriasis	2	45+8.5	0
Acne	1	106	0
Allergy	1	47	0
Dermatitis	1	35	0
Lipoma	1	72	0
Sebaceous Cyst	1	15	0
Squamous Cell Carcinoma	1	12	0
Vasculitis	1	76	0
Herpes Zoster	1	12	0
Other	1	DNR	1
Total	**21**		**3**

Discussion

The results of this database study revealed a total of 1133 temporary and 100 permanent license suspensions over a four-year period in the United Arab Emirates. This equates to an annual average of 283 temporary and 25 permanent license suspensions. In 2022 approximately 10,000 pilots are employed by the four major commercial airlines in the UAE. This calculates the annual temporary incapacitation rate to 2.8% and the permanent suspension rate to 0.25%. Evans and Radcliffe [8] reported an annual temporary incapacitation rate of 4.3% which is slightly higher. However, the 1.5% difference is probably not significant and within the normal margin of statistical error. It should be noted that Evans et al. [8] have also included inflight medical events which was not captured by our data. Accurate planning and flight scheduling is important for any commercial airline and these figures will be helpful to plan and roster pilots and consider temporary license suspensions. Another important factor is cost. We have previously shown that a dedicated musculoskeletal rehabilitation unit results in significant cost savings and earlier return to work. [16] When using the figures from our publication, the calculated cost for each day of temporary grounding is calculated to $1,500 per day excluding the costs for medical treatment. These figures will be helpful for financial planning. [16]

Musculoskeletal conditions were the most common reasons for temporary medical license suspension with a mean period of 115 days. Of the total 392 cases, 83% were related to trauma. One hundred and fifty-two cases were related to fractures and 92 cases to joint dislocations and ligament injuries. Obviously, pilots have to maintain fitness and are engaged in athletic activities that possibly account for the relatively high number of traumatic injuries in this population group. The annual incidence for traumatic injuries for air crew has previously been reported to be 73-81 per 100,000 population for females and 24-100 per 100.000 population for men. [24] Previously, Hohmann et al. have shown that a dedicated musculoskeletal rehabilitation unit reduced the time to return to flying by 39% from a mean of 188 to 85 days. [16] Applying the findings of Hohmann et al.[16] to this study it is possible that return to flying for musculoskeletal conditions could be reduced to 70 days, resulting in significant cost-savings.

The second most common reason for temporary incapacitation was medical illnesses. However, of the 335 cases, 44% were related to cardiac disease such as arrythmias (29%), angina (24%) and hypertension (41%). The incidence of cardiac related disease is moderately higher than in the normal population. Hemingway et al. reported a 2.03 incidence for men and 1.89 in women per 100 population. [15] Annual medical license examinations in pilots are a possible cause for these discrepancies, as it can be expected that quiet cardiac disease will be detected resulting in further tests and temporary suspension. The least common reasons were dermatological conditions. Of the 21 cases, ten cases were related to melanoma and 2 pilots (20%) did not return to work. This is consistent with the current published literature [27] and the results of this database study confirm a higher risk for pilots. A total of 59 cases were related to ENT conditions; 34% were caused by acute infections such as sinusitis, tonsilitis and otitis. Evans et al. have reported annual incapacitation rates in pilots and noted that 6% of

all medical incapacitations were associated with ENT conditions. [8] The findings in our study were similar. In our study cohort nearly 5% of temporary suspensions were correlated to ENT conditions.

One hundred and seventy-four cases of temporary incapacitation were pertaining to surgical pathologies. Thirty percent were related to inguinal hernia repairs, 14% to appendicitis and 10% to cholecystitis. Inguinal hernia repairs are performed at a rate of 240 episodes per 100,000 population in the UK [20] and the all ages incidence has been reported to be 13 per 10,000 population. [26] The annual incidence of appendicitis ranges between 7-10%. [10] The incidence of cholecystitis among people with gallstones are unknown but of patients admitted to hospital for biliary disease 20% have acute cholecystitis. [11] The findings in this study are in accordance with the published literature and do not suggest an increased prevalence in pilots.

Ninety-three pilots (7.5%) were temporarily suspended for urological conditions. The most common reasons were renal (38%) and ureter stones (28%). Evans et al. reported a slightly lower rate of 4% for genitourinary related causes. [8] The percentage of urolithiasis in our study cohort was 5.1%. These figures are similar to previously reported data. Hyams et al. demonstrated that 3.7-4.6% of commercial aviation pilots were diagnosed with urolithiasis. [17] Masterson et al. [21] showed that the prevalence in Navy pilots is 2.4 % and Lang et al. [18] analysed data from the Global Burden of Disease database that the incidence of urolithiasis in the normal population was 1.4%. The available data suggests that pilots probably have a higher risk of genitourinary renal and ureter stones. These differences are possibly caused by the low humidity levels in the airplane cabin resulting in hypohydration. [31] Another contributing factor is that pilots possibly minimize fluid intake during flight to reduce the need for micturition. This may be more prevalent since the introduction of locked flightdeck

doors, making it more difficult to easily access the toilet. It will be interesting whether future studies will show an increase in renal disease in pilots.

Sixty-eight pilots were temporarily suspended for opthalmological conditions. Cataract surgery (20%) and retina disorders (20%) were the most common causes for opthalmological conditions; a total of 68 cases were recorded. Evans et al. reported that 2% of the temporary medical unfitness was associated with ophthalmologic disorders. Temporary medical license suspension for ophthalmologic disorders was significantly higher in our sample and reached 5.5% of all cases. The mean age of pilots in this group was 44.8+13.2 years compared to 47 years in the Evan's cohort. Risk factors for cataract are age, smoking, long-term use of steroids and other medications, exposure to ultra-violet radiation, diabetes, trauma, hypertension and radiation therapy. [6] One could safely assume that these risk factors are similarly distributed between Evan's study cohort and the study group of this research with the exemption of exposure to ultra-violet radiation. In the United Kingdom the average hours of annual sunshine are 1400 compared to 3000 hours in the United Arab Emirates. [29] The substantial difference between the UK and United Arab Emirates could possibly explain the higher incidence of cataracts.

Sixty-one pilots were temporarily suspended for psychiatric and mental health issues. The most common causes were anxiety (47%) and alcohol disease (16%) followed by depression (13%). The mean days of suspension was the highest with 493 days for alcohol related disorders and 832 days for depression. In addition, the rate of permanent loss of license in this group was the highest of all subgroups, reaching 33%. Wu et al. performed an anonymous survey and showed that depressive and mental health disorders are higher when

compared to the normal population but similar to those found in other high stress occupations. [30]

Although only 30 cases were associated with obstetric and gynaecological conditions, this cohort had the longest mean days for license suspension and the second highest rate of permanent loss of license. However, of the 30 cases, 27 pilots were incapacitated because of pregnancy. It could therefore be concluded that gynaecological disease does not play a role for temporary license suspensions in female pilots.

Ascertainment of medical causes for temporary license suspensions is important and highlights medical risks that require the most attention but will also aid to determine possible future changes to medical requirements. [8] Previous studies have reported morbidity among airline pilots. Parker et al. showed that cardiac conditions accounted for 25% and musculoskeletal cases for 11% of disability. [25] Sykes et al. reported that of 595 pilots in New Zealand kidney disease was observed in 3.3% and melanoma in 1.9%. [28] Nicholas et al. surveyed over 10,000 airline pilots for self-reported disease and established that the most common causes for disease were melanoma, motor neuron disease and cataracts. [23] Evans et al. have documented the annual incapacitation rate in pilots. In their series of over 700 patients, accidents accounted for 18%, musculoskeletal for 18% cardiovascular events for 14% and psychiatric diseases for 10% of the annual rates. [8] The incapacitation rates from these studies are similar to the results from our study, showing that musculoskeletal and cardiac related conditions account for the majority of temporary medical unfitness in commercial pilots. Pilots reporting sick or unable to return to flying duties can affect the ability of an airline to ensure a manageable roster. Typically, reserve cover and pilots on standby allows adequate coverage for these scenarios. For routine rostering and planning, the

incidence of temporary medical incapacitation, knowledge about the expected mean duration of medical unfitness and subsequent return to work is helpful. The goal of database studies is to provide information for data-driven strategies, and the data reported in this study may be valuable for airlines for planning and including expected sickness rates for pilots. This is in agreement with Evans and Radcliffe, who noted a lack of data when studying commercial pilot incapacitation rates. [8]

This study has limitations. This study is limited by the fact that it only included episodes of incapacitation resulting in temporary suspension of both medical- and flying license. It is possible that pilots did not report minor injuries and illness and continued with their duty despite a compulsory reporting requirement. As such the real rate of illness and injury may have been underreported. The period of incapacitation was defined as the time from license suspension by the regulatory authority to the time of license reinstatement. It is possible that operational and other reasons have caused delayed reporting of incapacitation and also a delay in requesting license reinstatement to the regulatory authority, causing inaccurate data. However, this is a limitation of any database study which may vary in the degree of detail and accuracy. **[13]** In contrast, database studies are considered to be representative of the population of interest and serve as an inexpensive source of reliable data. **[13]** The established criteria for return to work and reinstatement of the return to flight privileges was based on the regulations of the local regulatory body **[12]** and other regulatory authorities **[7,9]** may have different functional criteria. This limits the external validity of the study. It is possible that the ICD-10 categorization of pathology by the treating physician was incorrect over- or underinflating certain diagnoses. In addition, it is also possible that we have incorrectly categorized reported ICD-10 codes.

Conclusions

This database study showed that musculoskeletal condition are the most common reasons for temporary loss of medical license followed by medical and surgical conditions. The least common reason were dermatological conditions. The longest period of incapacitation was associated with psychiatric conditions followed by medical and ENT conditions. The annual calculated temporary incapacitation rate was 2.8% and the permanent suspension rate was 0.25%. The results of this study may help in understanding the reasons for temporary pilot incapacitations related to medical conditions and possibly aid with rostering and return to work planning.

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