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LETTER FROM THE EDITOR

Dear Readers:

It is my pleasure to introduce a new contributor to *Re-flections*. In this issue, Dr. Oscar Cartaya, the newest member of RGA's Medical Department, writes about the relationship between disability claim practice and life underwriting. Dr. Cartaya brings to RGA extensive experience and a wealth of knowledge in both of these fields. I am certain that you will enjoy his insights.

Also in this issue is an article that discusses a sometimes-overlooked life risk—the risk that medical care may contribute to excess mortality. The article discusses Fatal Adverse Drug Reactions (FADR) and how to evaluate the factors that place a person at risk for this cause of death. The importance of recognizing FADR risk may become greater as we are presented with more information about an individual's use of both prescription and non-prescription medication.

I hope you enjoy the issue. Your comments and feedback are welcome.

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DISABILITY CONCEPTS IN LIFE INSURANCE UNDERWRITING

This is the first in a series of upcoming articles exploring the relationship between current disability claim practice and life underwriting practice. The concept of a relationship between disability and life expectancy is not a novel one. However, current life underwriting practice often limits the use of the relationship between disability and life expectancy to psychiatric, musculoskeletal and neurologic disorders.

An extensive background in the disability field is valuable in assessing mortality risk in life underwriting. In my experience, the application of disability concepts to life underwriting is much wider than is currently practiced. In this and future articles, I will explore this relationship and attempt to provide useful tools and techniques for the evaluation of life expectancy derived from disability claim practice. >>>

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Disability is not a well-defined condition; indeed, disability is largely based upon the contractual definition used for each particular case, and depends upon the occupation and level of training of the claimant being evaluated. For example, a professional trumpet player may be totally and permanently disabled from his occupation by something as simple as Bell's Palsy. A surgeon may be disabled from performing surgery by relatively minor hand injuries, and a commercial airline pilot may be grounded by any number of medical conditions that would not affect those with different occupations. All of these people may be perfectly able to work at other jobs even though they cannot perform their own.

To complicate matters, most disability policies provide tiered benefits under which benefits are paid for a certain number of years if the claimant cannot perform his own occupation. After the initial benefit period ends, the definition of disability becomes more restrictive and pays benefits only if the claimant cannot perform any gainful occupation. Therefore, in actual practice, the determination and adjudication of disability claims is oriented to the evaluation of each individual case, with attention to contractual definitions and occupational and educational levels. This type of approach is not useful in the evaluation of life expectancy.

Another approach to disability, used largely by the U.S. Social Security Administration (SSA), takes a more standardized and generally applicable functional approach. Under SSA rules, disability is defined as the inability to perform any occupation for gain. There are no tiers of definitions, as is common in private industry. The SSA goes further and publishes listings of medical conditions and functional findings that limit individuals to such an extent that they are considered totally disabled from any gainful occupation. These listings are applicable to U. S. citizens, and every individual who meets the published listings—and applies for social security disability benefits—receives them whether the individual has contributed to the social security fund or not.

The listings provided by the SSA have practical use in the evaluation of mortality and life expectancy. Although most of the listings refer to musculoskeletal problems with very limited impact upon life expectancy, a significant number deal with broad medical problems that produce disability and limit function in ways that directly affect life expectancy. For example, an individual with chronic obstructive lung disease is considered disabled when forced expiratory volume at 1.0 seconds ($FEV_{1.0}$) values reach a certain level. The life expectancy of an individual with such a severe respiratory impairment is markedly reduced. The degree of severity of systemic disorders producing total disability is therefore a valid determinant for use in life expectancy evaluations.

This article is largely derived from the SSA disability listings. In the following sections, I will attempt to provide life underwriters with useful techniques for evaluation of life insurance cases. >>>

OBESITY

Obesity is difficult to study systematically because of the need to use height and weight tables. In order to compare multiple cases of obesity and reach valid conclusions, it is convenient to avoid the use of height and weight tables and express build in terms of body mass index (BMI). BMI, a single number, is a ratio of weight versus height expressed in a way that produces identical results whether the measurements of height and weight are in inches and pounds or in meters and kilograms. The mathematical formulas are as follows:

English system: BMI = [weight (lb.) ÷ height (in.) ÷ height (in.)] x 703

Metric system: BMI = weight (kg.) ÷ [height (m.)]^2

A person six feet (72 in./1.829 m.) tall weighing 210 lbs (95.25 kg.) would have the following BMI:

English system: BMI = [210÷72÷72] x 703 = 28.47

Metric system: BMI = 95.25÷[1.829x1.829] = 28.47

The SSA had a disability listing for morbid obesity until 1998. According to this listing, a person was disabled from all gainful occupations if height and weight were equal to or above those in Table 2 *and* one other of the following conditions existed: symptomatic arthritis; hypertension with diastolic pressures persistently in excess of 100; a history of congestive heart failure; chronic venous insufficiency with leg pain and edema; respiratory insufficiency with forced vital capaticy (FVC) below 2.0 liters or significant hypoxemia (as per Table 1).

Table 1

Blood Gasses At Sea Level
(To determine respiratory failure and disability related to obesity)

Arterial pCO_2	Arterial $p0_2 \leq$ than
≤ 30	65
31	64
32	63
33	62
34	61
35	60
36	59
37	58
38	57
39	56
40	55

In the SSA height and weight tables (Table 2), a disabling weight level is defined as twice the optimal weight for a given height. BMI data was not originally included in the SSA tables; it has been added to demonstrate how disparate height and weight data makes more sense when using BMI as a measurement unit.

A review of this table indicates that a BMI around 46 for males and 44.5 for females is disabling when combined with the other medical conditions listed. However, since many of these other medical conditions are present in most morbidly obese individuals, a BMI at or above these levels is essentially disabling and can prevent individuals from performing gainful work. >>>

In general life underwriting practice, obesity is considered as a risk factor for other diseases. However, in the extreme, morbid obesity can disable people and is itself a major determinant of mortality. Consider the findings of S. Kenchaiah's Group published in the New England Journal of Medicine. This group concluded that obesity was the cause of 11 percent of all cases of congestive heart failure among men and 14 percent of all cases of congestive heart failure among women.

Table 2

Height	MEN Weight (lbs.)	MEN BMI	WOMEN Weight (lbs.)	WOMEN BMI
56			208	46.70
57			212	45.94
58			218	45.63
59			224	45.31
60	246	48.11	230	44.98
61	252	47.68	236	44.65
62	258	47.26	242	44.32
63	264	46.83	250	44.35
64	270	46.91	258	44.35
65	276	45.99	266	44.33
66	284	45.90	274	44.29
67	294	46.11	282	44.23
68	302	45.98	290	44.16
69	310	45.84	298	44.07
70	318	45.69	306	43.97
71	328	45.81	314	43.86
72	336	45.63	322	43.73
73	346	45.71		
74	356	45.77		
75	364	45.56		
76	374	45.59		

Morbid obesity at BMI levels over 46 is clearly associated with respiratory failure, hypertension, edema and venous stasis, arthritis, and possibly congestive heart failure. Therefore, these individuals may be a much higher mortality risk than what is normally assessed. I encourage taking a more conservative approach in rating cases with morbid obesity and BMI above 45-46. A BMI/Disability table is presented on page 6 (Table 3), or you can find many BMI calculators on the Internet.

PSYCHIATRIC DISORDERS

Psychiatric mortality is primarily related to suicide, and is due to three major disorders: alcoholism, major depressive disorders, and schizophrenia. The determination of psychiatric disability is dependent upon the claimant's ability to interact with others and/or perceive reality. For example, claustrophobics are considered disabled if intolerance to enclosed spaces is incompatible with their occupation (i.e. a submarine sailor). This has little or nothing to do with increased mortality risk. Psychiatric disability is largely independent of mortality risk resulting from psychiatric conditions.

Fifty-four percent of all suicides in the U. S. involve patients with major depressive disorder. The suicide risk among these patients increases dramatically with a history of one or more hospitalizations for depression. It is estimated that 15 percent of all patients hospitalized with a major depressive disorder will commit suicide. Among these patients, the suicide is preceded by a feeling of long-term hopelessness. Psychiatric disability may play a role in these cases, and the inability to hold a gainful job may increase feelings of hopelessness to a breaking point. The decision to commit suicide among these patients is internal and is usually premeditated. Comorbidities, like concurrent alcoholism, are common and increase the overall risk of suicide.

Fifteen percent of all suicides in the U.S. involve patients with chronic alcoholism. There is no apparent relation between the incidence of suicide and the length of time the patient has been an alcoholic, or the number of failed rehabilitation programs. The decision to commit suicide among alcoholics is usually sudden and is generally >>>

preceded by a major recent loss. The loss of a loved one, the loss of a job, or a divorce commonly triggers a suicide among alcoholics. Comorbidities, like concurrent major depressive disorder, are common and increase the risk of suicide.

Schizophrenics are also at increased risk for suicide. It is estimated that approximately 10 percent of all chronic schizophrenics end their lives by suicide. However, it is not known what circumstances clearly predispose schizophrenics to take this action. More study is needed in this area.

From an underwriting perspective, psychiatric cases should be screened for major depressive disorder cases with a history of hospitalization, inability to hold a job, alcoholism, chronic alcoholism with a recent personal loss, and chronic schizophrenia. These cases have the highest risk for suicide among all psychiatric cases and should always be screened carefully.

Oscar Cartaya, M.D.

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Table 3 BMI / Disability Table

	Normal						Overweight					Obese										Extreme Obesity																			
BMI	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**	**51**	**52**	**53**	**54**
Height (Inches)	**Body Weight (pounds)**																												**Disabled**							
58	91	96	100	105	110	115	119	124	129	134	138	143	148	153	158	162	167	172	177	181	186	191	196	201	205	210	215	220	224	229	234	239	244	248	253	258
59	94	99	104	109	114	119	124	128	133	138	143	148	153	158	163	168	173	178	183	188	193	198	203	208	212	217	222	227	232	237	242	247	252	257	262	267
60	97	102	107	112	118	123	128	133	138	143	148	153	158	163	168	174	179	184	189	194	199	204	209	215	220	225	230	235	240	245	250	255	261	266	271	276
61	100	106	111	116	122	127	132	137	143	148	153	158	164	169	174	180	185	190	195	201	206	211	217	222	227	232	238	243	248	254	259	264	269	275	280	285
62	104	109	115	120	126	131	136	142	147	153	158	164	169	175	180	186	191	196	202	207	213	218	224	229	235	240	246	251	256	262	267	273	278	284	289	295
63	107	113	118	124	130	135	141	146	152	158	163	169	175	180	186	191	197	203	208	214	220	225	231	237	242	248	254	259	265	270	278	282	287	293	299	304
64	110	116	122	128	134	140	145	151	157	163	169	174	180	186	192	197	204	209	215	221	227	232	238	244	250	256	262	267	273	279	285	291	296	302	308	314
65	114	120	126	132	138	144	150	156	162	168	174	180	186	192	198	204	210	216	222	228	234	240	246	252	258	264	270	276	282	288	294	300	306	312	318	324
66	118	124	130	136	142	148	155	161	167	173	179	186	192	198	204	210	216	223	229	235	241	247	253	260	266	272	278	284	291	297	303	309	315	322	328	334
67	121	127	134	140	146	153	159	166	172	178	185	191	198	204	211	217	223	230	236	242	249	255	261	268	274	280	287	293	299	306	312	319	325	331	338	344
68	125	131	138	144	151	158	164	171	177	184	190	197	203	210	216	223	230	236	243	249	256	262	269	276	282	289	295	302	308	315	322	328	335	341	348	354
69	128	135	142	149	155	162	169	176	182	189	196	203	209	216	223	230	236	243	250	257	263	270	277	284	291	297	304	311	318	324	331	338	345	351	358	365
70	132	139	146	153	160	167	174	181	188	195	202	209	216	222	229	236	243	250	257	264	271	278	285	292	299	306	313	320	327	334	341	348	355	362	369	376
71	136	143	150	157	165	172	179	186	193	200	208	215	222	229	236	243	250	257	265	272	279	286	293	301	308	315	322	329	338	343	351	358	365	372	379	386
72	140	147	154	162	169	177	184	191	199	206	213	221	228	235	242	250	258	265	272	279	287	294	302	309	316	324	331	338	346	353	361	368	375	383	390	397
73	144	151	159	166	174	182	189	197	204	212	219	227	235	242	250	257	265	272	280	288	295	302	310	318	325	333	340	348	355	363	371	378	386	393	401	408
74	148	155	163	171	179	186	194	202	210	218	225	233	241	249	256	264	272	280	287	295	303	311	319	326	334	342	350	358	365	373	381	389	396	404	412	420
75	152	160	168	176	184	192	200	208	216	224	232	240	248	256	264	272	279	287	295	303	311	319	327	335	343	351	359	367	375	383	391	399	407	415	423	431
76	156	164	172	180	189	197	205	213	221	230	238	246	254	263	271	279	287	295	304	312	320	328	336	344	353	361	369	377	385	394	402	410	415	426	435	443

Source: Adapted from Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults: The Evidence Report.

POLYPHARMACY AND FATAL ADVERSE DRUG REACTIONS

The magnitude of Fatal Adverse Drug Reactions (FADR) was brought to the public's attention by Lazarou et al. in the April 15, 1998 edition of the Journal of the American Medical Association (JAMA). In the article, meta-analysis of 39 U.S. hospital records over the preceding three decades suggested that as many as 106,000 FADR occurred annually. Lazarou considered the incidence of FADR in hospitalization, plus the incidence of other Adverse Drug Reactions (ADR) resulting in hospital admission. He excluded errors in hospital administration, non-compliance, overdose, drug abuse and therapeutic failures. This controversial article stimulated considerable debate about the true extent of FADR. A number of follow-up articles in JAMA questioned the conclusions of the original article, and some felt that the true annual number of FADR in the U.S. should be closer to 10,000.

Although establishing an accurate annual number of FADR remains difficult, it nevertheless appears that it is not a trivial subject, and it is certainly worthy of further study. To put its significance into context with other non-disease specific causes of death, it can be compared to motor vehicle fatalities, which annually claim 30,000- 40,000 lives. While the total number of annual FADR may only be in the range of 10,000, the suggestion that as few as one percent of serious ADR are reported to the FDA leads one to question whether FADR might be underreported.

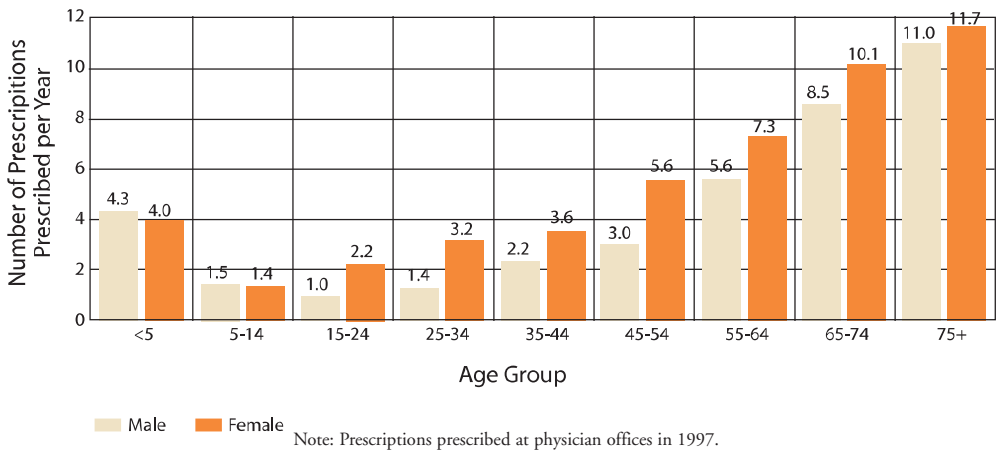
It is usually not possible to accurately predict a specific individual's susceptibility to FADR for the purpose of risk selection, although there may be some clues as to which type of person is at greatest risk. There is a great deal of medical literature that delineates the risk factors most commonly associated with FADR. In the broadest terms, the groups at highest risk are typically the elderly, people taking multiple medications, and people with comorbidity.

Ultimately, anyone who uses prescription, non-prescription, or even herbal medications is at some risk of FADR. There are approximately 2,800 prescription and almost 2,000 non-prescription medications available in the U.S. It is estimated that there are 14 billion prescriptions written annually in the U.S. Clearly, a great many people are exposed to some degree of risk from the medications they are taking. Elderly people, however, consume a disproportionate amount of medication. Between the ages of 45 and 75, prescription drug use nearly triples. People older than age 65 consume about 25-30 percent of all prescription medications, and at ages 65 – 74, the average number of prescriptions prescribed per individual per year is more than nine. At ages greater than 75, the average number of prescriptions prescribed per individual per year is more than 11.

It is known that alcohol-drug interactions increase the risk of FADR, and the severity of these interactions increases with age. Estimates of drug abuse in people older than age 65 suggest that as much as 10 percent of this demographic group fulfill some of the criteria for alcohol abuse. The combination of a high use of medication and relatively high rate of alcohol abuse puts this age group in the high-risk category of FADR. In the general population, it is estimated that as many as 25 percent of emergency room admissions are related in some way to alcohol-drug interactions.

A variety of other factors also put the elderly at greater-than-average risk for FADR. Drug non-compliance is a common problem for elderly people. This takes the form of deliberate or accidental overuse or abuse, forgetting, and overly complex and changing drug schedules. These factors can be compounded in >>>

Average Number of Prescriptions Prescribed, by Age and Sex, 1997



Note: Prescriptions prescribed at physician offices in 1997.
Source: National Association of Chain Drug Stores. *The Chain Pharmacy Industry Profile*, 1999; analysis based on data from the National Ambulatory Medical Care Survey, 1997.

the face of co-existing depression or dementia. The risk of non-compliance increases significantly when more than three medications are taken, and many elderly people take substantially more than three drugs.

The elderly are also more prone to FADR because they tend to have chronic disease(s), often have impaired cognition, and because of the types of medication they use. In addition, the elderly have several physiological differences from younger people that put them at increased risk. Specifically, they have a higher concentration of body fat, a lower body water weight, decreased gastrointestinal tract motility, lower serum albumin, and decreased renal and hepatic function. These factors cause their bodies to absorb, store, and metabolize medications differently.

ADR generally fall into one of four categories: non-allergic drug reactions, allergic drug reactions, medication errors, and drug interactions. Although many ADR may be initiated in the community and often go unrecognized and unreported, most FADR are thought to occur in an in-patient setting. Most of the people who die from FADR were initially either relatively healthy, or only moderately ill. Approximately 10 percent of medical in-patients will experience one or more ADR during their hospital stay.

There are a wide variety of drugs associated with FADR; those used to treat chronic obstructive pulmonary disease, antithrombotic drugs, and coronary artery disease/congestive heart failure drugs. The more complete list of general categories include: anesthetic agents, antibiotics, anticoagulants, antidepressants, anti-diabetic drugs, anti-seizure drugs, antihistamines, anti-psychotic drugs, cardiovascular drugs, narcotic and non-narcotic analgesics, sedatives and hypnotics. Each of these drug categories has unique mortality risks associated with its use. For instance, the sedative/hypnotic category leads to increased risk of falling and increased mortality from serious fractures in the elderly.

In an in-patient setting, most FADR are attributable to oral or written miscommunication (by the doctor, nurse, or pharmacist), name confusion of similar-sounding or -spelled drugs, labeling/packaging confusion, and human errors including the administration of improper doses, the administration of the wrong drug, or utilizing an incorrect route of administration.

Death due to FADR can occur in many forms. However, hepatitis, hepatic failure, cardiopulmonary arrest, overdose toxicity, and agranulocytosis are the most common. It is perhaps not unrealistc to presume that a least a few deaths due to 'accidental' means may in some way have been related to impairment of the senses secondary to prescription or non-prescription drugs, with or without the additive effects of alcohol.

An underwriter can benefit from knowledge of FADR by keeping in mind that the groups at most risk are the elderly, those exposed to a large number of drugs, and those who may be suspect for alcohol excess. Clearly, a current or recent record of a person's pharmaceutical history will be of assistance. Not only will it be possible to make an educated guess as to the reason for each of the drugs being used, but the underwriter will also know the total number of drugs being used. This will provide a rough guide to the risk of FADR, and will be a useful adjunct to the traditional medical information provided on cases for estimating expected mortality. When taken into context with all the other underwriting information at our disposal, it should help in making more well thought decisions.

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