American Board of Orthopaedic Surgery Practice of the Orthopaedic Surgeon: Part-II, Certification Examination Case Mix

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J Bone Joint Surg Am. 88:660-667, 2006. doi:10.2106/JBJS.E.01208

THE ORTHOPAEDIC FORUM

American Board of Orthopaedic Surgery Practice of the Orthopaedic Surgeon: Part-II, Certification Examination Case Mix

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The American Board of Orthopaedic Surgery (ABOS) is one of the twenty-four separate boards that make up the American Board of Medical Specialties. Of the twenty-four boards, fourteen require an oral examination. At present, the ABOS is the only board with a computerized data collection system that allows for the analysis of the collected information in the database.

The ABOS exists to serve the interests of the public and the medical profession by establishing educational standards for orthopaedic residents and by evaluating the initial and continuing qualifications and competence of orthopaedic surgeons. Upon completion of an approved residency program, applicants for board certification must pass a comprehensive, proctored written examination (the Part-I examination). Applicants must then practice orthopaedics for twenty-two months, twelve of which must be in one location. Many elect to begin the practice requirement following a fellowship. The applicants must then satisfactorily complete a thorough credentialing process and pass an oral examination (the Part-II examination) that is based on all of the candidate's operative cases in six consecutive months beginning one year before the oral examination.

Before 1998, candidates submitted individual case lists on paper. Beginning in July 1998, candidate case lists were collected as part of a nationwide orthopaedic database as a way of organizing the case lists for review and case selection for oral examination. The computerized lists can be analyzed for the entire candidate group or subgroups. This yields a comprehensive dataset of approximately 700 candidates per year.

TABLE I-A Overall and Relative Number of Candidates, Cases, Procedures, and Complications by Application Year

	1999	2000	2001	2002	2003
Candidates	659	723	741	718	618
Cases	77,320	90,266	93,510	92,307	78,498
Procedures	101,419	130,247	136,752	133,111	120,101
Complications	9892	11,791	11,788	11,497	10,619
Average no. of cases per candidate	117	125	126	129	127
Average no. of procedures per candidate	154	180	185	185	194
Average no. of complications per candidate	15	16	16	16	17

TABLE I-B Distribution of the 618 Applicants in 2003 by Declared Subspecialty

Specialty	No. of Applicants	Percentage of Total
General orthopaedics	339	54.8
Spine	70	11.3
Sports medicine	67	10.8
Hands and upper extremity	54	8.7
Adult reconstructive	24	3.9
Pediatric orthopaedics	21	3.4
Foot and ankle	19	3.1
Trauma	16	2.6
Tumors	8	1.3

Data Collection Methods

Candidates for certification enter all operative procedures performed in six consecutive months in the year prior to examination. The candidate's case lists are verified from each hospital or surgical center during the six-month period. The case list from each hospital or surgical center must be notarized by the director of medical records. The ABOS has contracted with an outside vendor (Data Harbor Solutions, Hinsdale, Illinois) to develop and manage the databases. During the first year of data collection (1998), floppy disks were used. Subsequently (beginning in 1999), data were submitted by means of a secure password-protected web-based interface. Once completed, the case lists are reviewed by practicing ABOS-certified orthopaedic surgeons working with the ABOS. From the entire case list submitted by the candidate, twelve cases are selected for review at the Part-II oral certification examination. The candidates are required to submit medical records, radiographic studies, video or photographic prints from cases of patients managed with arthroscopy, and data with regard to outcomes and complications. Candidates bring materials and accompanying information for ten of the selected cases to the examination. The full case list, as well as aggregate practice summary data, is available for the oral examiners.

The database used by the Part-II candidates provides a relatively complete and accurate assessment of practice over a six-month period. There are strong motivations for the candidate to provide an accurate list of cases, and safeguards are built into the system. Still, there is a potential for bias in the reported data if there were a conscious alteration of practice patterns by candidates during the surgical list collection period. The online system limits the possibility of invalid or incomplete data through the use of drop-down menus, look-up tables, and enforcement of the requirement for complete records prior to final submission of the case list.

The case lists include the diagnosis (*International Classification of Diseases, Ninth Revision* [ICD-9] codes), age, sex, procedures performed (*Current Procedural Terminology* [CPT] codes), and date of surgery for each patient. Information with regard to death, complications, and outcome for each patient is mandatory. Reporting the occurrence of anesthetic complications; specific surgical and/or technical complications; specific medical and/or systemic complications, including death; and surgeon-reported outcomes of pain, deformity, function, and patient satisfaction is mandatory. No uniform method of reporting these data is in use, although the ABOS has pilot-tested an outcome instrument to better standardize outcome data. Today, the candidate and patient

TABLE II Deciles of Cases per Candidate by Application Year

Deciles of Cases (per Candidate)	1999	2000	2001	2002	2003
Minimum	2	16	16	14	17
10	54	56	57	60	55
20	68	74	73	78	76
30	82	86	89	93	92
40	84	98	102	107	103
50 (median)	107	118	119	120	118
60	119	133	134	133	131
70	139	149	153	152	144
80	162	173	170	174	168
90	192	210	207	204	209
Maximum	391	343	435	625	489

TABLE III Top Twenty-five CPT Codes According to Counts, Ranks, and Change by Application Year*

CPT	Description	Count					
		1999	2000	2001	2002	2003	Total
29881	Knee arthroscopy/meniscus	6379	7782	8130	7823	7074	37,188
29826	Shoulder arthroscopy/decompression	1683	2392	3028	3335	3568	14,006
64721	Carpal tunnel surgery	3192	3775	3649	4382	3142	18,140
29877	Knee arthroscopy/chondral	2781	3293	3659	3513	3132	16,378
20680	Removal of support implant	2531	3631	3563	3577	3091	16,393
29888	Knee arthroscopy/anterior cruciate ligament reconstruction	2183	2647	2733	2772	2418	12,753
27447	Total knee replacement	1996	1942	2394	2850	2134	11,316
27236	Repair of thigh fracture/femoral neck	2017	2338	2487	2402	2027	11,271
27244	Repair of thigh fracture/trochanteric	2577	2973	2748	2429	1752	12,479
11012	Débridement of skin/muscle/bone/fracture	1172	1981	1811	1608	1594	8166
29880	Knee arthroscopy/both menisci	1206	1509	1572	1689	1585	7561
27130	Total hip replacement	1305	1209	1538	1756	1277	7085
29824	Shoulder arthroscopy/distal clavicle	–	–	–	105	1267	1372
23412	Repair of tendon(s)/rotator cuff	483	827	1048	1074	1263	4695
25611	Repair fracture of radius/ulna/percutaneous	1155	1374	1450	1353	1175	6507
63047	Removal of spinal lamina	952	769	1019	1096	1119	4955
27814	Repair of ankle fracture/bimalleolar	930	1096	1276	1122	1056	5480
29822	Shoulder arthroscopy/débridement	508	751	1011	1144	1052	4466
22612	Lumbar spine fusion	652	729	932	1044	1018	4375
25620	Repair fracture of radius/ulna/distal part of radius	776	967	933	1059	1010	4745
63030	Low back disc surgery	1080	940	1073	976	995	5064
26055	Incise finger tendon sheath	1103	1485	1415	1486	960	6449
27792	Repair of ankle fracture/fibula	804	1073	1075	972	936	4860
27506	Repair of thigh fracture/shaft	748	978	1017	923	920	4586
27245	Repair of thigh fracture/trochanteric	209	350	703	708	918	2888

*CPT = *Current Procedural Terminology.* †The change in rank is the movement up or down from 2002 to 2003.

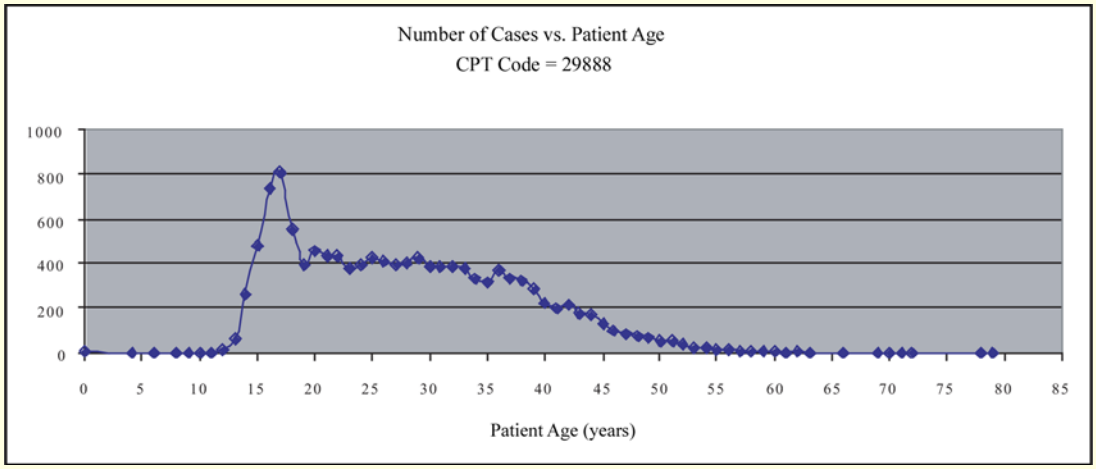

Fig. 1

Patient age distribution for anterior cruciate ligament surgery (1999 through 2003).

TABLE III *(continued)*

Rank					
1999	2000	2001	2002	2003	Change in Rank†
1	1	1	1	1	0
9	7	5	5	2	3
2	2	3	2	3	–1
3	4	2	4	4	0
5	3	4	3	5	–2
6	6	7	7	6	1
8	10	9	6	7	–1
7	8	8	9	8	1
4	5	6	8	9	–1
12	9	10	12	10	2
11	11	11	11	11	0
10	15	12	10	12	–2
–	–	–	210	13	197
37	27	19	19	14	5
13	13	13	15	15	0
17	29	21	18	16	2
19	17	16	17	17	0
35	30	23	16	18	–2
28	32	25	21	19	2
22	21	24	20	20	0
16	22	18	23	21	2
14	12	15	13	22	–9
21	18	17	24	23	1
23	20	22	27	24	3
90	83	37	36	25	11

burden have been deemed too high for this purpose.

Results: The ABOS Candidate Dataset Variables

The number of cases and procedures from 1999 through 2003 are listed in Table I-A. The table provides pooled information, including the number of applicants, surgical cases on individual patients, and total number of procedures (a given patient may have had more than one procedure performed during a single surgical case). Table I-B shows the average number of applicants according to their self-reported subspecialty. The declared subspecialty helps the Board to choose oral examiners. Declaration does not indicate whether the candidate has completed a fellowship. Rather, the choice of a subspecialty allows the candidate and the examiners to be matched in areas of practice and expertise.

The number of cases by deciles is listed in Table II. The median range was 107 to 120 cases for five years. This table is important as it shows not only the median surgical output but also the minimum and maximum number of cases for the six-month case list for 1999 to 2003.

The patient gender mix has been steady at approximately 54% male and 46% female.

Cases also may be reviewed by procedure codes (CPT) and/or diagnoses (ICD-9) (see Appendix). The top twenty-five individual procedures performed are listed in Table III. Three of the top four procedures involve arthroscopy codes: two knee and one shoulder procedure. Total knee and total hip arthroplasty ranked seventh and twelfth, respectively, in 2003.

Trends in the number of procedures from year to year are a reflection of changes in practice for Part-II candidates (Table III). Partial excision of the medial or lateral meniscus of the knee (CPT code 29881) remains the most common procedure, followed by carpal tunnel surgery (CPT code 64721). Shoulder arthroscopy and/or acromial decompression (CPT code 29826) moved up seven places over the five years. Absolute numbers of procedures, their rank order, and changes over time also are shown in Table III. The total number of procedures coded 29881 (meniscectomy) is consistently more than twice that of procedure 64721 (carpal tunnel release), which, until 2003, was the second most common procedure. Five of the top eleven procedures required the use of arthroscopy skills. When the absolute numbers are summed for these procedures, 56% of the top eleven procedures required arthroscopy.

Table IV lists the top twenty-five ICD-9 diagnosis codes. The practicing surgeon is aware that a single CPT code can be associated with more than one ICD-9 code and, similarly, an ICD-9 code can be associated with different surgical procedures or CPT codes. The ICD-9 codes for knee menisci were two of the top three codes reported. Similar to the data in Table III, the top five codes are consistent over the five years reported in the present study.

The Board can also monitor the average number of procedures and the percentile ranking for each of the most frequently performed pro-

TABLE IV Top Twenty-five ICD-9 Codes According to Counts, Ranks, and Change by Application Year*

Code	Description	Count					
		1999	2000	2001	2002	2003	Total
836.0	Tear of medial cartilage or meniscus of knee/current	4156	4894	5262	4702	4898	23,912
354.0	Carpal tunnel syndrome	3267	3702	3734	3677	3418	17,798
836.1	Tear of lateral cartilage or meniscus of knee/current	1836	2080	2356	2153	2259	10,684
820.21	Fracture of intertrochanteric section of femur/closed	2169	2656	2659	2423	2213	12,120
717.7	Chondromalacia of patella	1459	1809	2075	1813	1904	9060
715.16	Osteoarthrosis/localized/primary/involving lower leg	1513	1610	2110	2278	1897	9408
844.2	Sprain of cruciate ligament of knee	1502	1701	1934	1866	1789	8792
840.4	Rotator cuff (capsule) sprain	1057	1295	1419	1418	1696	6885
726.2	Other affections of shoulder region/not elsewhere classified	887	1252	1379	1591	1607	6716
726.10	Disorders of bursae and tendons in shoulder region/unspecified	758	930	1166	1160	1505	5519
996.4	Mechanical complication of internal orthopaedic device/implant and graft	1119	1398	1592	1673	1442	7224
813.42	Other closed fractures of distal end of radius (alone)	1238	1572	1675	1589	1366	7440
717.2	Derangement of posterior horn of medial meniscus	992	1156	1360	1386	1322	6216
727.61	Complete rupture of rotator cuff	543	862	1107	1171	1317	5000
724.02	Spinal stenosis of lumbar region	900	794	1118	1171	1279	5262
820.8	Fracture of unspecified part of neck of femur/closed	912	1125	1116	1186	1118	5457
824.4	Bimalleolar fracture/closed	955	1103	1265	1054	1095	5472
722.10	Displacement of lumbar intervertebral disc without myelopathy	806	849	1147	949	1089	4840
715.96	Osteoarthrosis/unspecified whether generalized or localized/involving lower leg	1093	966	1131	1148	1080	5418
715.11	Osteoarthrosis/localized/primary/involving shoulder region	574	666	773	852	1039	3904
727.03	Trigger finger (acquired)	1056	1290	1247	1281	934	5808
821.01	Fracture of shaft of femur/closed	843	989	1020	923	926	4701
717.83	Old disruption of anterior cruciate ligament	1111	1223	1088	1062	918	5402
813.41	Colles fracture/closed	840	903	923	868	884	4418
824.2	Fracture of lateral malleolus/closed	697	882	912	822	883	4196

*ICD-9 = *International Classification of Diseases, Ninth Revision.* †The change in rank is the movement up or down from 2002 to 2003.

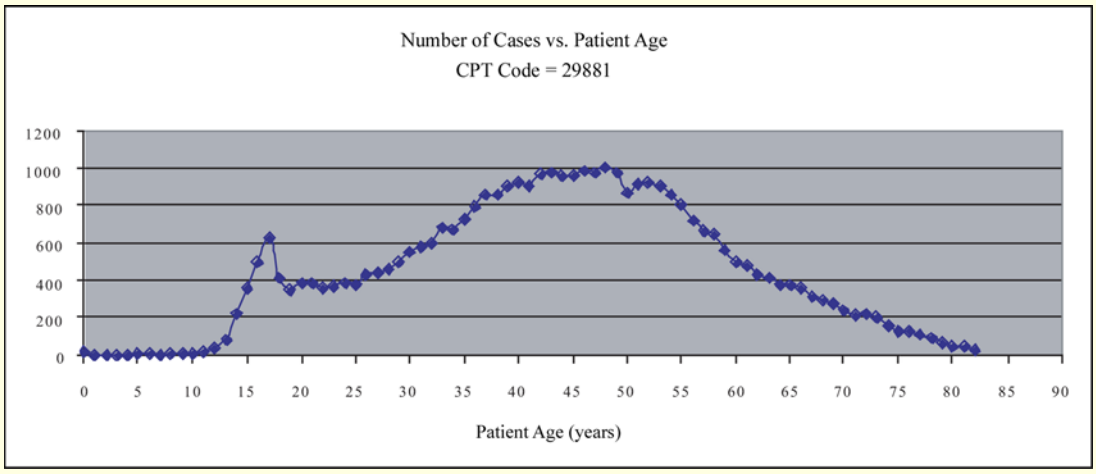

Fig. 2

Patient age distribution for meniscectomy (1999 through 2003).

TABLE IV *(continued)*

Rank					
1999	2000	2001	2002	2003	Change in Rank†
1	1	1	1	1	0
2	2	2	2	2	0
4	4	4	5	3	2
3	3	3	3	4	–1
7	5	6	7	5	2
6	7	5	4	6	–2
5	6	7	6	7	–1
12	10	10	11	8	3
18	12	11	9	9	0
25	21	15	17	10	7
9	9	9	8	11	–3
8	8	8	10	12	–2
14	14	12	12	13	–1
34	25	20	16	14	2
17	27	18	15	15	0
16	15	19	14	16	–2
15	16	13	20	17	3
22	26	16	22	18	4
11	19	17	18	19	–1
29	30	27	26	20	6
13	11	14	13	21	–8
191	18	23	24	22	2
10	13	21	19	23	–4
20	22	24	25	24	1
26	23	25	28	25	3

cedures. For example, the mean number of cases per applicant for CPT code 29881 (knee arthroscopy/partial meniscectomy) was 11.45 cases in 2003. The median number (a figure unaffected by extremes) in the most recent three years reported was consistently found to be eight cases (see Appendix). For code 29881, the maximum number of cases for an applicant in that six-month period for 2001 and 2002 was sixty-eight and fifty-nine, respectively, or about ten per month. However, for 2003, one applicant reported nearly double that number.

The top four spine CPT codes listed were among the top thirty-five procedures performed (see Appendix). However, 75% of the applicants participating in Part-II Board certification did not perform any of these four spine procedures. In 2003, seventy applicants listed their subspecialty as spine; there were 1501 lumbar spine fusions performed (935 CPT 22612 posterior, posterior lateral; 347 CPT 22630, posterior interbody technique; and 219 CPT 22558, anterior interbody technique). While average case volume numbers are not needed to evaluate a candidate's specific practice pattern, sometimes a broad view provides valuable information. The average number of procedures based on the number of declared spine specialists yields 13.4 posterior lumbar fusions (CPT 22612), five posterior interbody fusions (CPT 22630), and three anterior interbody fusion procedures (CPT 22558) during the six-month period prior to their application. Such data can provide potentially interesting information on practice patterns to any surgeon who is just starting practice. Obviously, practice patterns often change as a surgeon's practice matures. These collated data also can be used to provide valuable information about the use of specific orthopaedic procedures. For example, Figure 1 shows that CPT 29888 (anterior cruciate ligament surgery) is being performed on predominantly young patients, with a peak volume among those of high-school age and then a decline in young adults. Meniscectomy extends over a larger age range (Fig. 2, CPT 29881), while the rate of chondral surgery procedures (Fig. 3, CPT 29887) gradually increases to the age of fifty. Similar comparisons can be made for any coded procedure.

Discussion

These data provide orthopaedic surgery residents and educators accurate information about the types and volumes of procedures that young orthopaedic surgeons are likely to perform in the first two years of their practice. They can expect to perform around 120 cases over a six-month period (Table II), on mostly middle-aged patients (Table III), and many involve the use of arthroscopic procedures (five of the top eleven CPT codes, Table III).

The Board can also compare the average volume of procedures performed by the candidate pool with the number of procedures performed by any individual candidate. For example, the applicants for 2001, 2002, and 2003 averaged about eleven knee arthroscopies during their six-month case-collection period. The 50th percentile figure (median) was consistently eight, meaning that 50% of the applicants performed fewer than eight knee arthroscopies and 50% performed more

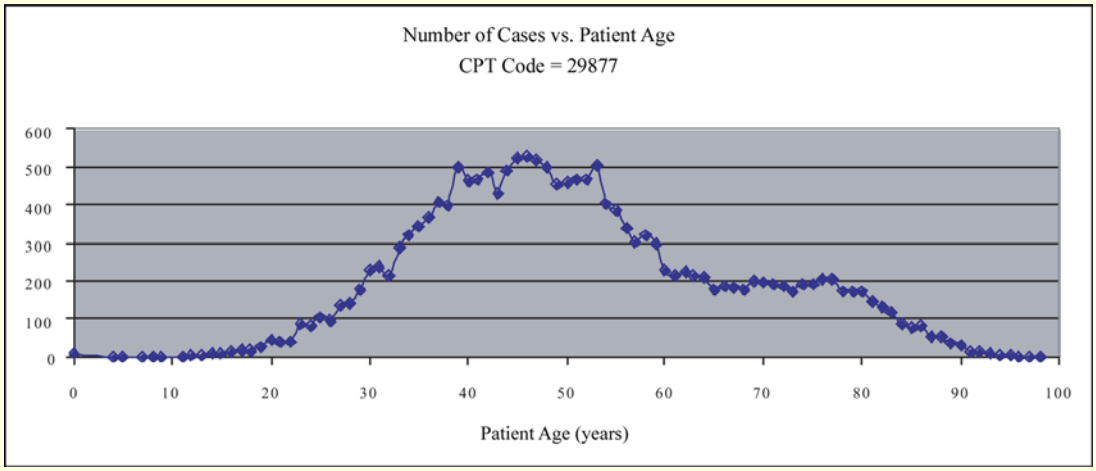

Fig. 3

Patient age distribution for chondral surgery of the knee (1999 through 2003).

than eight knee arthroscopies. An extreme number posted by a candidate might be indicative of a new surgeon stepping into a specialty practice, or it might suggest a difference in the individual's indications for that operation compared with the larger orthopaedic community. The Board serves the public interest and must review extreme counts on either end of the spectrum.

Candidate case lists are expected to be accurate for the six-month period of collection. The Board is unable to extrapolate beyond this time. Maintenance of Certification, the new process of recertification, also involves a case list. This will provide another opportunity to view current practice patterns.

Lifelong learning is important in our profession. The ABOS recognizes candidate anxiety and the time necessary to prepare for each examination. The ABOS also realizes the value inherent in the process of preparing for these examinations. It is the goal of the Board that orthopaedic patients benefit from this rigorous examination and peer review.

The ABOS has worked for many years to understand and to improve the Part-II oral examination, and the orthopaedic oral examination process has actually been a model for several other surgical specialty board examinations. The test has been determined to be as psychometrically valid as the initial written examination by Measurement Resources (Chicago, Illinois), a psychometric educational consultation firm used by most of the American Board of Medical Specialties Surgical Specialty Boards who employ an oral examination as part of their certification process.

Use of the Data by the ABOS and the Profession

These data are of obvious importance in the testing of candidates for certification by the ABOS. The aggregate data are also of use in determining what conditions recent graduates of residency programs are seeing and what procedures they are performing in practice. They also may be used to inform the Board and the profession in general of changes in practice patterns over time.

Additional queries to the database may provide details about regional differences in practice, what fellowship-trained surgeons are doing compared with non-fellowship-trained candidates, the breakdown of procedures for the general orthopaedist compared with the subspecialist, and complications associated with treatment of various diagnoses. This is clearly demonstrated for spine surgery, wherein 75% of the candidates in the study reported performing none of the top four spine surgeries.

Use of the Data for Health-Care Research

This information provides an interesting database for health-care research and policy priorities for orthopaedic surgery. These data provide advantages over other secondary databases because they are more accurate with regard to surgeon location and procedures performed and are verified by the candidates taking the examination. The disadvantages of the database include the relatively young age of the surgeons and the limited years of practice after training. Thus, these data are predominantly reflective of surgeons early in practice as opposed to those whose practice has matured. Clearly, these data can be a valuable addition to other available databases such as the National Hospital Discharge Survey, the National Ambulatory Medical Care Survey, the National Health Interview Survey, and the Longitudinal Studies on Aging (all of which are maintained by the National Center for Health Statistics).

It should also be pointed out that candidates may not practice in the same manner during the time that the cases are collected for Part-II certification. For example, controversial treatment methods or very difficult cases might be avoided by the candidates. The data are still accurate but may not be totally representative of the candidates' prac-

tices at times when data are not being collected.

Part of the charge of the research committee of the Board is to explore ways to better utilize this database for quality improvement and safety in orthopaedic practice and to provide information to examination candidates and diplomates that improves practice. New queries of the dataset should benefit the Board, our examination candidates, orthopaedic surgeons in practice, and the overall practice of medicine, to the ultimate benefit of our patients.

In conclusion, the database of a useful research tool for orthopaedic surgery-related health research. It is a valuable source of information on the practices of the examinees and may well be extremely useful in the design of residency education, the initial written examination for ABOS certification, and, ultimately, in the evaluation of practice performance.

Appendix

eA Tables presenting descriptive statistics from the top ten CPT codes and the top four spine CPT codes, and the top procedure codes for spine subspecialists are available with the electronic versions of this article, on our web site at jbjs.org (go to the article citation and click on "Supplementary Material") and on our quarterly CD-ROM (call our subscription department, at 781-449-9780, to order the CD-ROM).

NOTE: The research committee also acknowledges Donald T. Kirkendall for his work in the preparation of this manuscript.

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The authors did not receive grants or outside funding in support of their research for or preparation of this manuscript. They did not receive payments or other benefits or a commitment or agreement to provide such benefits from a commercial entity. No commercial entity paid or directed, or agreed to pay or direct, any benefits to any research fund, foundation, educational institution, or other charitable or nonprofit organization with which the authors are affiliated or associated.

doi:10.2106/JBJS.E.01208