



MMA IMAGING TASK FORCE
FINAL REPORT, CONCLUSIONS
and RECOMMENDATIONS

May 2008



BACKGROUND

At the 2006 Annual Meeting of the Minnesota Medical Association (MMA), Resolution 217 (Access to Imaging Services) was introduced and ultimately referred to the MMA Board of Trustees. As introduced, the resolution read as follows:

RESOLVED, that the Minnesota Medical Association actively oppose any legislation or regulation that would restrict the right of qualified physicians to appropriately utilize in-office diagnostic imaging services, and be it further

RESOLVED, that the Minnesota Medical Association actively oppose efforts to require patients to receive imaging services at imaging centers that are mandated to require specific medical specialty supervision but support patients' rights to receive imaging services at facilities where appropriately trained physicians can perform and interpret them regardless of medical specialty, and be it further

RESOLVED, that the Minnesota Medical Association adopt as policy that appropriately trained and licensed physicians shall be permitted to use diagnostic or therapeutic modalities in their own office settings for appropriate diagnosis and treatment, which is an integral part of patient care.

A substitute version of the resolution was recommended by a MMA reference committee, but was not acted upon by the House of Delegates as a result of the referral to the MMA Board. The proposed language read as follows:

RESOLVED, that the Minnesota Medical Association actively oppose efforts by private payers, hospitals, legislators and regulators to impose policies designed to control utilization and costs of medical services unless those policies can be proven to achieve cost savings and quality improvement while not curtailing appropriate growth or compromising patient access or quality of care, and be it further

RESOLVED, that the Minnesota Medical Association actively oppose efforts to require patients to receive imaging services at imaging centers that are mandated to require specific medical specialty supervision and support patients' ability to receive imaging services at facilities where appropriately trained medical specialists

can perform and interpret imaging services regardless of medical specialty, and be it further

RESOLVED, that the Minnesota Medical Association actively oppose any attempts by legislators, regulatory bodies, hospitals, third-party payers, and others to restrict payment for imaging procedures based on physician specialty and continue to support payment for imaging procedures performed and interpreted by physicians based on the proper indications for the procedure and the qualifications and training of the imaging specialists in that specific imaging technique regardless of their medical specialty.

Coincidentally, in the fall of 2006, medical imaging emerged as an important and controversial issue when one Minnesota health plan (soon followed after by others) implemented a prior authorization/notification requirement for all outpatient high-tech imaging services (i.e., CT, MRI, MRA, PET, nuclear cardiology).¹ Given the strong negative reaction from the physician community to this requirement, and in light of the other high-tech imaging issues identified in Resolution 217, the MMA Board of Trustees authorized the creation of an Imaging Task Force.

Task Force Charge

The charge to the task force was to develop policy recommendations for consideration by the MMA Board of Trustees on access to and use of imaging services, including issues of ownership, delivery (e.g., supervision/training of personnel), and utilization management.

Specifically, the task force was encouraged to:

- Analyze existing research and data on the factors that drive imaging utilization (including the identification of data gaps/limitations);
- Examine factors that influence how imaging services are delivered;
- Identify and understand the current legal and regulatory factors that impact imaging services;
- Research payment policy and its influence on the utilization and delivery of imaging services;
- Explore current efforts and proposals (national and local) to address utilization and/or delivery of imaging services;
- Study quality improvement efforts affecting the use and/or delivery of imaging services.

A roster of task force members can be found in Appendix A.

1. Part of the rationale given for implementing the requirement stemmed from a 2005 law that required the Minnesota Department of Human Services (DHS) to institute prior authorization requirements for a variety of services, including elective outpatient high-technology imaging (i.e., PET, MRI, CT, and nuclear cardiology). The requirements also applied to prepaid health plans unless the plans were otherwise using evidence-based practices to address these services (Session Laws 2005, 1st Special Session, Chapter 4, Sec. 82).

Task Force Framework

In order to manage its workload and focus its attention given the breadth of issues involved, the task force established the following framework:

- Understand imaging utilization and cost trends, both nationally and within Minnesota.
 - What conclusions can be drawn?
- Review and analyze imaging utilization management approaches that are in use or under consideration, both nationally and within Minnesota.
 - Legal and regulatory approaches
 - Quality-improvement approaches
 - Payment policy and insurance benefit design approaches
 - What conclusions can be drawn?
- Develop recommendations for MMA policy and/or advocacy on the identified issues.

UTILIZATION AND COST TRENDS

The task force examined utilization and cost of medical imaging services in an attempt to answer the following questions:

- What are the rates of imaging use?
- How fast is imaging use growing?
- How much is spent on imaging services?
- Is the cost of imaging justified because it improves patient care?
- What are the potential drivers of imaging utilization?

Rates of Imaging Use

Nationally available data on rates of use of noninvasive diagnostic imaging (i.e., radiography, mammography, ultrasound, CT, MR, nuclear imaging, bone densitometry) suggest the following:

- For commercially-insured subscribers under the age of 65, utilization is 758 studies per 1,000²
- For HMO enrollees under the age of 65, utilization is 666 studies per 1,000³
- For Medicare (fee-for-service) enrollees, utilization is 3,249 per 1,000 or more than four times the rate of use of those under the age of 65.⁴

A 2001 national study shows the following utilization for all imaging services among Medicare enrollees:⁵

- 4,176 diagnostic procedures per 1,000
- 274 therapeutic procedures per 1,000

In that same study, a state-specific analysis showed that higher

imaging use was associated with a large total state population, a large number of radiologists, and a large number of Medicare providers. Variation across states was best explained by the total number of Medicare providers in the state. State-specific rates (procedures per 1,000 Medicare enrollees) showed that Minnesota was in the second lowest quartile (26th-50th percentile), along with Wisconsin, Iowa, Nebraska, Oklahoma, and Kansas. Among states with the highest imaging use were Nevada, Texas, Louisiana, Florida, Michigan, and New York.

With the exception of the data cited above, access to published, Minnesota-specific data on medical imaging utilization is extremely limited. A 2005 Minnesota Department of Health analysis of data from hospitals and freestanding diagnostic imaging facilities showed that more than one million CT procedures were performed, 89% of which were performed in hospitals. Approximately 410,000 MR procedures were performed, 60% of which were performed in hospitals. The health department analysis did not, however, include data on utilization rates.

In late 2006, Medica reported that utilization trends for high-tech imaging services (e.g., CT, MRI) had increased by 37% since 2003.⁶

Unpublished data from the Minnesota Department of Human Services suggests that for Medicaid/GAMC enrollees (2001-2005), the use of MRI and CT scans of the knee increased by 49% among fee-for-service beneficiaries; the frequency of MRIs and CT scans of the brain or head increased 28% and 22%, respectively. For fee-for-service recipients with a diagnosis of headache in 2005, approximately 14% received advanced diagnostic imaging procedures – CT, MRI, or PET scans; the use of MRIs of the lumbar spine increased 50% and the frequency of CT scans of the lower spine increased 58%. In 2005, nearly 16% of patients with a diagnosis of low back pain received imaging procedures (x-ray, MRI, CT, or PET scans).⁷

The Growth of Imaging Utilization

The task force also examined growth in the utilization of medical imaging. Available Medicare data suggests that from 1999-2004 (cumulative) the per-beneficiary growth in the volume of imaging services was 62%, compared to 31% growth for all physician services. The most current Medicare data (2004-2005) shows a 5.5% increase in volume per Medicare beneficiary for all physician services, with imaging volume growing the most at 8.7%. Among

2. Burkhardt JH, Sunshine JH. Utilization of radiologic services in different payment systems and patient populations. *Radiology* 1996; 200: 201-207.

3. *Ibid.*

4. Maitino AJ, Levin DC, et al. Nationwide Trends in Rates of Utilization of Noninvasive Diagnostic Imaging among the Medicare Population between 1993 and 1999. *Radiology* 2003; 227: 113-117.

5. Bhargavan M, Sunshine JH. Utilization of radiology services in the United States: Levels and Trends in Modalities, Regions, and Populations. *Radiology* 2005; 234: 824-832.

6. Medica, Connections newsletter, December 2006.

7. Minnesota Department of Human Services, Health Services Advisory Council. Draft (unpublished) Prior Authorization Evidence Summaries - Imaging for Knee Pain; Imaging for Low Back Pain; Imaging for Headache, October 2006.

the specific procedures driving overall imaging use were advanced CT and MRI. Overall, imaging services accounted for 16% of all Medicare physician services.⁸

Spending on Medical Imaging

The cost of medical imaging is significant. In 2004, total imaging costs, including insurance reimbursement and patient out-of-pocket expenses, were estimated at \$100 billion, or an average of \$350 per person in the U.S.⁹ For the period 1999-2004, there was a 90% increase in Medicare Part B spending for imaging services, from \$5.8 billion in 1999 to \$10.9 billion in 2004.¹⁰

Locally, the Minnesota Council of Health Plans reported that \$18 of an individual's monthly health insurance premium goes to cover imaging costs.¹¹ Medica reported that annual costs for high-tech imaging were projected to increase at a rate of 27%, adding an estimated \$3 per member per month to health care premiums.¹²

The Value of Medical Imaging

While national data suggests high levels of utilization, growth in excess of other physician services, and significant spending on medical imaging, the value of imaging services warrants consideration. Such analyses, however, are complex and the results are variable depending on the end point chosen for analysis (e.g., mortality, productivity, functional status, improved diagnostics/treatment, etc.). In general, the benefits of higher medical spending associated with technological advances in health care have exceeded the costs.¹³

The potential for imaging services to improve diagnosis and patient treatment are significant. A small sampling of some of the studies that validate this potential include:

- Image-guided biopsies for bone cancer have fewer complications/faster healing than open surgical biopsies.¹⁴
- Coronary angioplasty improves outcomes for many patients

than drug therapy alone.¹⁵

- Mammography screening for women 50-69 reduces breast cancer mortality.¹⁶

There is also reason to believe that imaging may, in some circumstances, be underused, such as the use of carotid imaging for patients with symptomatic cardiovascular disease or transient ischemic attack.¹⁷

While there is reason to believe that most imaging services are appropriate and provide value-added benefits to patient care, the well documented variation (threefold) in the use imaging services across the country is often referenced as evidence of the overuse of imaging.¹⁸ While there is some limited research from Fisher and Wennberg to suggest that regions that provide more imaging services do not have better Medicare survival rates¹⁹, it is not clear if overall survival is the most appropriate end point to use in evaluating the value of imaging services. For example, reductions in morbidity and disablement may be equally important factors to consider.

Locally, there are no published, statewide data on imaging utilization, its variation, or its appropriateness. Medica, however, did suggest that for Minnesota Medica enrollees fully 10-20% of high-tech imaging studies are "unnecessary."²⁰

Drivers of Imaging Services

Given the existing data on imaging utilization, it is fair to ask what factors may be driving the growth. For much of the overall volume growth in health care, technological change is often cited as the reason.²¹ This fact may be particularly relevant in the technology-dependent field of imaging. Technological changes include both treatment substitution (replacing old technology with new) and treatment expansion (treating more people due to new technologies). As previously stated, in general, the benefits of technological advances exceed the costs.²²

8. Medicare Payment Advisory Commission (MedPAC), Report to the Congress: Medicare Payment Policy, March 2007. Note: Medicare data is per beneficiary volume growth (adjusted, via RVU weighting, for changes in intensity/complexity).

9. Farnsworth C. Testimony March 17, 2005 before the House Ways and Means Subcommittee on Health. Washington, D.C. as reported in: Iglehart JK. New Era of Medical Imaging-Progress and Pitfalls. N Engl J Med 2006; 354: 2822-2828.

10. MedPAC, July 18, 2006 Testimony before U.S. House Subcommittee on Health.

11. BlueCross BlueShield of Minnesota, Webinar held March 21, 2007.

12. Medica, Connections newsletter, December 2006.

13. Cutler D., Rosen A., Vijan S. The Value of Medical Spending in the United States, 1960-2000. N Engl J Med 2006; 355(9): 920-927.

14. Jelinek, J., M. Murphey, J. Welker, et al. 2002. Diagnosis of primary bone tumors with image-guided percutaneous biopsy: Experience with 110 tumors. Radiology 223: 731-737.

15. Andersen, H. R., T. Nielsen, K. Rasmussen, et al. 2003. A comparison of coronary angioplasty with fibrinolytic therapy in acute myocardial infarction. New Engl J Med; 349(8): 733-742.

16. U.S. Preventive Services Task Force, Agency for Healthcare Research and Quality. 2002. Screening for breast cancer: Recommendations and rationale. Pub. No. 03-507A; Rockville, MD.

17. McGlynn, E., S. Asch, and J. Adams. 2003. The quality of health care delivered to adults in the United States. New Eng J Med; 348(26): 2635-2645.

18. Medicare Payment Advisory Commission (MedPAC), Report to the Congress: Medicare Payment Policy. March 2005.

19. Unpublished analysis (reported in lbid), based on data used in following studies: Fisher, E., D. Wennberg, T. Stukel, et al. 2003a. The implications of regional variations in Medicare spending. Part 1: The content, quality, and accessibility of care. Annals of Internal Medicine; 138(4): 273-287. Fisher, E., D. Wennberg, T. Stukel, et al. 2003b. The implications of regional variations in Medicare spending. Part 2: The content, quality, and accessibility of care. Annals of Internal Medicine; 138(4): 288-298.

20. Fazio C. Testimony before MN House Health Care and Human Services Finance Division, March 30, 2007.

21. See, for example: Cutler, D., McClellan, M. 2001. Is technological change in medicine worth it?, Health Affairs; 20(5): 11-29. Newhouse, J. P. 1993. An iconoclastic view of cost containment; Health Affairs 12(suppl): 152-171. Newhouse, J. P. 1992. Medical care costs: How much welfare lost? Journal of Economic Perspectives; 6(3): 3-21.

22. Cutler D., Rosen A., Vijan S. The Value of Medical Spending in the United States, 1960-2000. N Engl J Med 2006; 355(9): 920-927.

In addition to the capability to do more things and do them better, another potential driver of imaging utilization is the capacity to provide such services. One limited study recently found that areas of the country with higher availability of specific technologies (especially diagnostic imaging) also had higher utilization and higher spending.²³ A related issue is the role that physician investment in imaging services plays in overall utilization. Physician self-referral for imaging services is a topic that generates strong opinions. A more thorough discussion of self-referral is found later in the report.

Other potential drivers of imaging growth identified and considered by the task force were population growth/demographic changes (estimated to contribute 0.5% to growth); patient preference/convenience; defensive medicine/liability concerns; and payment policy.

Utilization and Cost Trends Conclusions

After review and discussion of the data described above, the MMA Imaging Task Force reached the following conclusions on imaging utilization and cost trends:

- There is evidence, primarily from national sources (i.e., Medicare) that imaging utilization is increasing, especially for MR and CT.
- Nationally, there is evidence of variation in imaging utilization patterns; the impact of such variation on quality and patient outcomes is not known, nor is the relative appropriateness of the varying levels of use.
- There is a dearth of current, reliable, state-specific or payer-specific data on imaging utilization, growth, variation, and appropriateness.
- The role of “defensive medicine” (physicians providing services that may not otherwise be clearly medically indicated out of fear of malpractice liability) is real and may be a driver of imaging utilization.
- The factors driving imaging utilization and imaging ordering patterns are complex.

IMAGING UTILIZATION MANAGEMENT: LEGAL & REGULATORY APPROACHES

The Legal Landscape: Self-Referral

One of the mechanisms used to moderate imaging utilization is the adoption of legislation and/or regulation. Among the most specific strategies implemented in this regard was the

passage of federal legislation to address concerns about disparate levels of utilization of services by physicians who owned or had an investment interest in specific services (including imaging services) and those physicians who did not have an ownership or investment interest. In the most frequently cited study on the issue of physician self-referral, Hillman et al found that self-referring physicians performed imaging 4.0 to 4.5 times as often and generated mean imaging charges per episode of care that were 4.4 to 7.5 times higher than radiologist-referred physicians.²⁴ A summary of the principal literature on the association between imaging utilization and self-referral can be found in the Appendix B.

The early evidence regarding the effect of self-referral on utilization led Congress to adopt laws to limit physician self-referral. Self-referral is defined as: “The practice of a physician referring a patient to a medical facility in which he/she has a financial interest.” There are two primary concerns associated with self referral: 1) It may encourage over-utilization of services thereby driving up health care costs; 2) It could create a captive patient base for referrals, limiting competition by other providers.

There are both federal and state statutes on self-referral.

♦ Federal Laws

There are two federal laws relating to self referral – the Anti-Kickback Statute²⁵ and Stark.²⁶

The Anti-Kickback Statute applies to remunerations for Medicare and Medicaid patients. The following remunerations are illegal: “knowing and willful solicitation or receipt of remuneration (including any kickback, bribe, or rebate) ... in return for referring an individual to a person for the furnishing of any item or service for which payment may be made under a Federal health care program, or ...in return for purchasing, leasing, ordering, or arranging for or recommending ... any good, facility, service, or item for which payment may be made in whole or in part under a Federal health care program.”

There are 23 safe harbor exceptions to the federal Anti-Kickback Statute.²⁷ In order to be protected by a safe harbor exception, each requirement of an applicable safe harbor must be met.

Violation of the Anti-Kickback Statute is a felony and a conviction can include a fine of up to \$25,000, imprisonment

23. Baker L., Birnbaum H., Geppert J., Mishol D., Mayneur E. The Relationship Between Technology Availability and Health Care Spending. Health Affairs Web exclusive; November 5, 2003.

24. Hillman BJ, Joseph CA, Mabry MR, Sunshine JS, Kennedy D, Noether M. Frequency and costs of diagnostic imaging in office practice: a comparison of self-referring and radiology-referring physicians. N Engl J Med 1990; 323:1604-1608.

25. Social Security Act section 1128B(b), 42 U.S.C. sec. 1320a-7b(b)

26. 42 U.S.C. section 1395 nn

27. The most commonly used Safe Harbor Exceptions include: investments in small health care joint ventures; space rental; equipment rental; personal services and management contracts; referral services; warranties; discounts; employee compensation; group purchasing organizations; waivers of Medicare Part A inpatient cost-sharing amounts; increased coverage, reduced cost-sharing amounts; reduced premium amounts offered by health plans to beneficiaries; price reductions offered to health plans by providers; obstetrical malpractice insurance subsidies for underserved areas; investments in ambulatory surgical centers; investments in group practices; referral arrangements for specialty services; and cooperative hospital service organizations.

of up to five years, or both. Convicted persons may also be excluded from participation in the Medicare/Medicaid programs. A civil monetary penalty of treble damages (three times the illegal remuneration) plus \$50,000 per violation of the Anti-Kickback Statute was added in 1997 under the 1997 Balanced Budget Act.

The Stark law includes two basic prohibitions:²⁸

1. An entity cannot bill Medicare or Medicaid for services provided pursuant to an illegal referral.
2. A physician cannot make a referral²⁹ to an entity for the furnishing of designated health services³⁰ that may be payable by Medicare or Medicaid if the physician (or immediate family member of the physician) has a financial relationship³¹ with the entity unless an exception³² applies.

For a physician practice, the most important Stark exception is the in-office ancillary services exception. This exception allows members of the group to refer patients for designated health services (including radiology and imaging services) to facilities owned or operated by the group practice. For example, many physicians' group practices have their own labs and equipment to provide designated health services. Without the in-office ancillary exception, members of the group would be prohibited from using their own lab or facilities for their patients.

Violators of the Stark law are subject to sanctions including: 1) denial of payment/repayment; 2) fines of \$15,000 per referral; and 3) exclusion from Medicare/Medicaid.

♦ State Laws

There are three significant differences between the Stark statute and state self-referral restrictions:

1. State self-referral prohibitions are generally not limited to the payer involved (unlike Stark which applies only to Medicaid and Medicare referrals).
2. State self-referral prohibitions are often broader than Stark in terms of providers regulated. Many include chiropractors,

optometrists, nurses, and physical therapists (Stark only applies to physician referrals).

3. State statutes often encompass a broader range of services than the Stark statute (Stark only applies to referrals for designated health services).

At least 37 states have restrictions on physician self-referral. While many states have enacted laws or administrative rules restricting physician self-referral arrangements, the laws vary greatly in terms of the complexity and breadth of application.

There are three Minnesota statutes relating to self-referral – fee splitting statute;³³ disclosure of financial interest;³⁴ and, anti-kickback.³⁵

Minnesota's fee splitting statute is relevant because it prohibits physicians from "referring a patient to any health care provider... in which the referring physician has a financial or economic interest... unless the physician has disclosed the physician's financial or economic interest..."

Penalties for violating this provision may include loss of license, inability to perform interstate telemedicine services, or disciplinary action as determined by the Board of Medical Practice.

A more explicit disclosure law was adopted by the Minnesota Legislature in 2004. That law precludes health care providers (including physicians) with a financial or economic interest in a facility from referring a patient to that facility unless the health care provider discloses in writing to the patient, in advance of the referral, the existence of the financial or economic interest. The law further requires, for those making referrals, the posting of a notice of the financial/economic interest "in a conspicuous public location." The financial interests covered by this law include equity or debt security issued by an entity; membership, proprietary interest, or co-ownership; as well as employer-

28. Stark Realities: How physician self-referral act affects group practices, Digneman Dancer & Christopherson PLC, 1998, <http://library.findlaw.com/1998/Jan/1/126376.html> (12/16/05)

29. Referrals under Stark include: 1) A request by a physician for, or the ordering of, any item or service for which payment may be made under Medicare Part B or Medicaid. (This includes a request for a consultation with another physician and any test or procedure ordered by, performed by, or supervised by that other physician.) 2) A request by a physician that includes the provision of laboratory services or the establishment of a plan of care that includes laboratory services.

30. Designated health services include: Clinical laboratory services; Physical therapy, occupational therapy and speech-language pathology services; Radiology and certain other imaging services; Radiation therapy services; Durable medical equipment and supplies; Prosthetic, orthotics, and prosthetic devices and supplies; Home health services; Outpatient prescription drugs; Inpatient and outpatient hospital services; Parenteral and enteral nutrients and PEN-associated equipment and supplies.

31. Financial Relationships include: A direct or indirect relationship between a physician (or immediate family member) and an entity in which the physician (or immediate family member) has an ownership or investment interest or with which the physician has a compensation arrangement. Ownership or investment interests may exist through equity, or debt and include options and nonvested interests. Ownership through equity refers to a direct ownership interest that does not involve debt. Examples include stocks or investments in a partnership. Ownership through debt exists anytime a physician (or immediate family member) has lent money or given other valuable consideration to an entity and the debt is secured in whole or in part by the entity or by the entity's assets or property. Examples include notes, mortgages, or bonds. A compensation arrangement includes any relationship involving any remuneration in cash or kind between a physician and an entity.

32. To qualify for the in-office ancillary services exception, the following requirements regarding location and performance must be met: A) Location: The designated health service must be performed in either (1) the same building where the referring physician or another member of the physician's group practice has his or her office, or; (2) a location used by the group practice for the centralized provision of the designated health service. B) Performance: The designated health service must be personally performed by the physician or another member of the group practice, or by individuals employed or directly supervised by a member of the group practice. According to the Office of Inspector General, "directly supervised" means the supervising physician must be in the same office suite and readily available in case of emergency when the service is performed.

33. Minn. Stat. § 147.091 Subd. 1(p)

34. Minn. Stat. § 144.6521 Subd. 1-2

35. Minn. Stat. § 62J.23

employee or independent contractor relationships.

Finally, Minnesota adopted legislation that extends the federal anti-kickback law to all persons and to all payers (i.e., not limited to just Medicare and Medicaid). In addition, the law gives the Commissioner of Health authority to adopt regulations that may be more restrictive than the federal anti-kickback statutes; to date, however, no such regulations have been promulgated.

Violators of the state anti-kickback law can face fines of \$1,000 or 110% of the estimated financial benefit that the person realized as a result of the prohibited financial arrangement or payment relationship, whichever is greater.

While both current American Medical Association (AMA) and MMA policies oppose any efforts to remove the in-office ancillary exception to the physician self-referral laws (Stark), pressure for change, both to remove the exception and to broaden Stark's scope, are real. For example, the Medicare Payment Advisory Commission (MedPAC) has recommended that nuclear medicine and PET services be added to the list of designated health services.³⁶ MedPAC has also recommended that the definition of physician "ownership" be expanded to include interests in an entity that derives a substantial proportion of its revenue from a provider of designated health services, which is intended to address physician ownership or leasing of, for example, MRIs to imaging centers/providers. Because arrangements rarely involve investment in the "biller" of service (i.e., the imaging center/provider), current exceptions allow for this type of agreement.

At the state level, there is also some interest in revisiting physician ownership. In a recent report from the Minnesota Department of Health, the following finding was noted:

"Similar to national trends, anecdotal evidence in Minnesota indicates that recent trends toward physician investments in medical facilities create potential financial conflicts of interest that could lead to overuse of services. Perceived abuses of existing exceptions to the federal self-referral law that are taking place nationally are believed to be occurring in Minnesota as well, although their extent in Minnesota is unknown..."³⁷

The report then recommended the creation of an independent commission to make "recommendations about the need for restrictions on physician self-referral that are more restrictive than current federal law, in order to curb perceived abuses related to the in-office ancillary services exception and group practice exception

to the Stark law. Any recommendations for a tighter standard will need to explicitly address ways of maintaining these exceptions for the many large multispecialty clinics in Minnesota that most likely do not pose significant risk of financial considerations influencing referrals."³⁸

Licensure and Certificate of Need

Another legal means by which states have sought to moderate utilization of imaging services is by establishing licensure standards and/or using certificate-of-need processes.

Minnesota does not license diagnostic imaging facilities,³⁹ but it does require such facilities to report annually (for each health plan, Medical Assistance and workers' compensation) the following data elements:

- Utilization data for MRI, CT, PET, SPECT procedures;
- Names of physicians with financial or economic interest (excluding salaried physicians, unless salary is adjusted for volume of services), and others with greater than 10% financial interest in facility;
- Number of units of each type of fixed, portable, and mobile scanners used at each location;
- Average number of hours per month each scanner was leased;
- Total number of procedures billed for at each location, by type of service (e.g., MRI, CT, PET, SPECT)

Another mechanism Minnesota has adopted to attempt to constrain overall health care costs, including investment in imaging services, is mandatory reporting of capital expenditures. The law, originally adopted in 1992 as part of the MinnesotaCare reforms, requires hospitals, surgical centers, diagnostic imaging centers, and physician clinics to annually report to the state capital expenditures for investments in excess of \$1 million (\$500,000 prior to June 1, 2003). Any expenditure in excess of \$1 million for the following services is required:

- Acquisition of a unit of medical equipment;
- A capital expenditure for a single project for the purposes of providing health care services, other than for the acquisition of medical equipment;
- Offering a new specialized service not offered before;
- Planning for an activity that would qualify as a major spending commitment; or
- A project involving a combination of two or more of the activities listed above.⁴⁰

While reporting in and of itself may have a modest deterrent effect, the law also provides the health department with authority to conduct retrospective reviews of reports to determine the

36. Medicare Payment Advisory Commission (MedPAC). Report to the Congress, Medicare Payment Policy, March 2005.

37. Minnesota Department of Health. Factors and Incentives Driving Investment in Medical Facilities, Report to the Legislature, February 2007.

38. Minnesota Department of Health. Factors and Incentives Driving Investment in Medical Facilities, Report to the Legislature, February 2007.

39. Defined as physicians' offices, clinics, mobile transport vehicles, outpatient imaging centers, and surgical centers; does not include hospitals or locations licensed as hospitals that offer diagnostic imaging services (M.S. § 144.565).

40. M.S. § 62J.17

“appropriateness” of the expenditures. In the event that the department determines the expenditure was not appropriate, the entity can be subjected to prospective review and approval of future expenditures. Since its enactment, over \$4 billion in spending has been reported and 900 retrospective reviews have been completed.⁴¹

Although Minnesota does not have a certificate-of-need (CON) law for purposes of controlling imaging utilization, many other states do. In fact, approximately 20 states use CON for MRI; about 23 states use CON for PET; and, about 14 states use CON for CT.⁴²

Several other regulatory approaches were reviewed by the task force – Medicare has established performance standards for imaging services provided in Independent Diagnostic Testing Facilities (IDTF). Medicare also regulates imaging provided in hospitals through its conditions of participation criteria. Physician offices, however, are not subject to either the IDTF or the hospital requirements. While both the federal and state governments are involved in regulating entities that use ionizing radiation, the primary purpose of that oversight is to ensure public safety not the production of high quality images.

Finally, the task force considered the regulatory model embodied by the federal Mammography Quality Standards Act, in which the FDA develops and enforces quality assurance standards for mammography equipment, technical staff, and physicians who interpret mammograms.

Legal and Regulatory Conclusions

After review and discussion of the information described above, the MMA Imaging Task Force reached the following conclusions on legal and regulatory approaches for addressing imaging utilization and cost trends:

- Data showing an association between imaging utilization and self-referral is quite dated (much of it preceding adoption of Stark).
- The limited data that is available does suggest that self-referral has, in the past, and may, currently, induce greater utilization of high-tech imaging services, although Minnesota-specific data is not available.
- Certificate of need is not an effective mechanism for controlling utilization of health care services, including imaging services and capacity.

IMPROVING THE QUALITY OF IMAGING SERVICES

There are a variety of strategies that have been identified, and employed to varying degrees, to improve the quality of imaging services provided. To the extent that improvements in quality reduce inappropriate, excessive, or duplicative imaging services, these strategies have the potential to impact imaging utilization. The following quality-related topics were reviewed by the task force.

Evidence-Based Decision Making

The uniform and consistent practice of evidence-based medicine is a goal that warrants significant attention and support, both at the individual physician level as well as at the community level. The most common definition of evidence-based medicine is as follows:

“The conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients. The practice of evidence-based medicine means integrating individual clinical expertise with the best available external clinical evidence from systematic research.”⁴³

Clinical practice guidelines, or appropriateness criteria, are among the most important tools that have been developed to support physicians in their ability to consistently deliver evidence-based medicine. With regard to imaging, guidelines represent the product of the evaluation of peer-reviewed literature that includes identification of imaging studies for specific clinical scenarios and an outline of the most likely benefits and risks. A tool to supplement guidelines is the use of clinical prediction rules that can help determine patients for whom imaging is not indicated.

Decision Support

Decision support helps to translate and implement evidence-based guidelines into daily medical practice. Decision-support tools rely on electronic medical-records-embedded or web-based algorithms that providers use at the point of service to determine the recommended diagnostic test to order.

Accreditation

Accreditation is a process that can be applied to both physicians (and other providers) as well as to facilities and technical equipment. The purpose of provider accreditation is to designate those providers who have shown that they have met or exceeded the established standards for training/education/experience for the performance of the specific procedures or diagnostic tests.

41. Minnesota Department of Health, Health Economics Program. Health Care Capital Expenditures in Minnesota, 1993 to 2004. Issue Brief 2005-04, August 2005.

42. CON Matrix 2005 compiled by Thomas Piper as reported in: Citizens League. Developing Informed Decisions, Report of the Citizens League Medical Facilities Study Committee, April 2006.

43. Sackett, DL; Rosenberg, WMC; Gray, JAM; Haynes, RB; Richardson, WS. Evidence-Based Medicine: What It Is and What It Isn't. British Medical Journal. 1996;312:71

Facility accreditation is accomplished by an external evaluation of the facility's ability to provide quality imaging services based upon criteria such as the professional qualifications of personnel, quality control programs, safety policies, and image quality/equipment calibration.

Interest in accreditation is growing. For example, UnitedHealthcare has announced that effective third quarter 2008, it will require outpatient imaging sites and providers that perform CT, CTA, MRI, MRA, PET, nuclear medicine/ cardiology and echocardiography exams to have completed and submitted an application to obtain accreditation as a condition for reimbursement.⁴⁴ UnitedHealthcare has indicated that it will recognize the American College of Radiology (ACR) and the Intersocietal Accreditation Commission (IAC) standards for purposes of its accreditation program.

Accreditation historically has been used as a voluntary means by which to improve and maintain consistent quality, establish standards, and differentiate a provider's services; this is in contrast to the mandatory approach (i.e., denial of payment) being employed by UnitedHealthcare.

Quality Improvement Conclusions

After review and discussion of the information described above, the MMA Imaging Task Force reached the following conclusions regarding the role of quality improvement approaches in moderating the utilization of imaging services:

- Evidence-based (as well as consensus-based) imaging guidelines are beneficial tools to support appropriate imaging utilization.
- It is important to acknowledge that, while beneficial, existing imaging guidelines have limitations that merit further review (e.g., clinical indications, site-of-service limits [outpatient/ ER], implications for primary care practices, expected and reasonable guideline deviation, etc.).
- Professional medical specialty societies are appropriate sources for the development of guidelines. It is important to recognize that there may be overlapping and/or conflicting guidelines issued by specialty societies.
- Clinical guidelines should never supersede clinicians' judgment in decision-making, but the burden of evidence should fall on physicians who choose to depart from guidelines
- Information technology solutions (e.g., decision-support and clinical prediction rules) are appropriate tools to guide real-time decision making and to integrate imaging guidelines into practice.
- Accreditation, both of providers and facilities, is a useful

process to support high quality delivery of imaging services.

THE ROLE OF PAYMENT POLICY AND INSURANCE BENEFIT DESIGN

Medicare Policy

As is true elsewhere, payment policy, particularly that of Medicare, strongly influences the delivery, supply, and utilization of health care services, including imaging services. Radiology services are composed of a professional component (PC) and a technical component (TC). The PC includes the physician work and liability costs of diagnostic and therapeutic radiology services; the TC includes cost of equipment, supplies, technician salaries, liability costs, etc. If the PC and the TC are provided by different providers, payment is made separately; if the same provider delivers both, a "global" payment is made.

Anecdotally, payment for imaging services is often identified as one of the fundamental drivers of the growth in imaging capacity and imaging utilization. In addition, Medicare payment for imaging services has undergone some dramatic changes recently due to Congressional action that was spurred on, in part, by recommendations from MedPAC.

With implementation of the 2006 fee schedule, Medicare implemented a multiple procedure payment reduction policy for the technical component (TC) of imaging procedures involving contiguous parts of the body. The reduction amounted to 25% for two or more images.⁴⁵ At the same time, however, the practice expense RVUs were increased by 0.3% to make the adjustment budget neutral. After the 2006 fee schedule was implemented, the Deficit Reduction Act of 2005 (DRA) was passed. The DRA included two imaging-related changes that the Congressional Budget Office estimated to yield \$2.8 billion in savings over five years. The first change eliminated the budget neutral provision for multiple imaging payments, which meant that as of January 1, 2007 the 2006 0.3% PE RVU increase was eliminated. In addition, the DRA capped payment for the TC of imaging services at the lesser of the physician fee schedule amount or the hospital outpatient rate (under the outpatient prospective payment system).⁴⁶ The purpose of this change was to address the perceived financial incentives in Medicare payment policy to provide (and build) outpatient imaging services. For example, prior to the change, the TC payment for an MRI of the brain or abdomen was \$903 under the physician fee schedule, and \$506 under the hospital outpatient rate.⁴⁷ Under the DRA cuts, the physician fee schedule is not eligible for the indirect rate adjustment increases available to hospitals. And, for many imaging services, the physician fee schedule remains locked below

44. UnitedHealthcare Online, Imaging Accreditation, January 2008.

45. The multiple procedure reduction was expected to be increased to 50% on January 1, 2007, but was not enacted.

46. Excludes mammography services.

47. Statement by Herb Kuhn, Director, Center for Medicare Management, Centers for Medicare and Medicaid Services, U.S. Department of Health and Human Services, on Payment for Imaging Services under the Medicare Physician Fee Schedule before the House Subcommittee on Health Committee on Energy and Commerce, July 17, 2006.

the payment levels provided by Medicare under the hospital outpatient prospective payment system.

There may be additional changes to Medicare payments for imaging services. The assumptions used by the Centers for Medicare and Medicaid Services (CMS) for calculating rates has been challenged by MedPAC, which claims that CMS' 50% imaging equipment use rate is too low. MedPAC also contends that CMS assumes too high an interest rate (11%) on the cost of capital to purchase imaging equipment. Analyses by MedPAC suggest that updating these assumptions could reduce imaging payments by 40-50%.⁴⁸

Patient Steerage/Centers of Excellence

A payment policy/network design tool that increasingly is being used by health plans/payers is the establishment of Centers of Excellence. Centers of Excellence for imaging services are identified providers that demonstrate performance by meeting/exceeding specified imaging quality metrics, implementing safety programs and clinical accuracy ordering guidelines, and by developing and effectively distributing educational resources. As a payment policy mechanism, the use of Centers of Excellence can serve to restrict or limit payment to only designated providers.

Pay for Performance

Pay-for-performance (P4P) programs reward medical groups and physicians based on their ability to meet or improve upon identified goals for clinical performance. As a payment policy tool, P4P is intended to create explicit financial incentives to change provider behavior and achieve specific results. The use of P4P to address imaging utilization is limited, but does occur. Within Minnesota, the use of P4P for imaging services generally is linked to physician use of imaging decision-support resources.

Utilization Review

Health plans/payers also use utilization review to explicitly monitor and control the use of, and expenditures for, health care services, including imaging services. In Minnesota, utilization review is regulated by state law and is defined as follows:

“... the evaluation of the necessity, appropriateness, and efficacy of the use of health care services, procedures, and facilities, by a person or entity other than the attending health care professional, for the purpose of determining the medical necessity of the service or admission...”⁴⁹

Under state law, utilization review includes both prior authorization (utilization review conducted prior to the delivery of a service, including an outpatient service) and certification

(a determination that an admission, extension of stay, or other health care service has been reviewed and that it, based on the information provided, meets the utilization review requirements of the applicable health plan and the health plan company will then pay for the covered benefit). State law defines standards for the utilization review processes, including timelines, data collection, and appeals.

Several Minnesota health plans have instituted prior authorization (or “prior notification”) programs for all outpatient, high-tech imaging services.⁵⁰ These programs generally require that the referring physician call the patient’s insurance company or its designated representative (typically an outside radiology management company) for approval before scheduling an imaging test. Imaging management personnel are expected to help providers utilize evidence-based recommendations to select the appropriate test.

Physician response to these programs has been strong and uniformly negative for a variety of reasons, including the broad application of the programs (i.e., to all outpatient high-tech imaging services), the administrative burden, and the inconsistent customer support provided by the programs.

Insurance Benefit Design

The task force also explored the way that insurance benefit design and coverage policy may influence imaging utilization. Nationally, approximately 4.5 million individuals have insurance plans with qualified health savings accounts (HSAs) coupled with a high-deductible health plan.⁵¹ Such policies, often referred to as consumer-directed plans, have as their philosophic underpinning the notion that patients armed with information about cost and quality will make smarter choices about the use of services and thereby generate greater quality and cost competition. Many outpatient imaging services are non-emergent in nature and may be discrete enough to allow for price and, possibly, quality comparisons. The role of consumerism in the use of imaging services is expanding, as evidenced by the recent decision by Wells Fargo to institute a 20% co-pay for imaging services.

Payment Policy and Insurance Benefit Design Conclusions

After review and discussion of the information described above, the MMA Imaging Task Force reached the following conclusions regarding the role of payment policy and insurance benefit design in moderating the utilization of imaging services:

- The current payment system skews investments toward imaging and procedures and, as such, serves as a key driver in the growth of imaging capacity.
- Prior authorization is an ineffective strategy to mitigate high-

48. MedPAC Comments on CMS Proposed Rule, Medicare program; Revisions to payment policies under the physician fee schedule, and other Part B payment policies for CY 2008 [CMS-1385-P] Federal Register, July 12, 2007, August 30, 2007.

49. M.S. § 62M.02, Subd. 20.

50. The MMA maintains that these programs are, in effect, utilization review. Health plans contend that the programs are notification/consultative and, therefore, not utilization review because no final denial is issued (i.e., physicians are permitted to override the recommendations of the imaging vendors).

51. America’s Health Insurance Plans (AHIP), January 2007 Census Shows 4.5 Million People Covered by HSA/High-Deductible Health Plans, April 2007.

tech imaging.

- Patients are experiencing rising out-of-pocket costs for health care services, including imaging services.
- There is limited data readily available to allow patients to understand the price, quality, and appropriateness of imaging services.

RECOMMENDATIONS

The MMA Imaging Task Force submitted, and the MMA Board of Trustees approved, the following recommendations:

1. To address the lack of current, useful, and valid data on imaging services in Minnesota, the MMA supports efforts to develop community-wide data to: a) understand Minnesota-specific imaging utilization trends; b) identify specific modalities of concern; c) consider issues of both overuse, underuse, and misuse; and, d) discern the impact of imaging services on patient outcomes, treatment decisions, quality of life, and productivity.
2. Given the lack of publicly available data, the MMA will work aggressively to pressure health plans/payers to clearly document and share relevant data regarding claims of inappropriate utilization of high-tech imaging services.
3. In order to reduce the inappropriate use of imaging (and other) services associated with defensive medicine, the MMA will explore possible changes to medical malpractice law to protect physicians who rely on evidence-based clinical guidelines.
4. The MMA will work to educate Minnesota physicians about self-referral laws/regulations.
5. As part of its commitment to supporting and promoting medicine's professional ethics, the MMA will work to educate physicians about their responsibility to recognize the potential financial conflict of interest associated with self-referral for imaging services.
6. The MMA reaffirms current MMA policy on self-referral and anti-kickback laws as follows:
 - **280.19 MMA Policy Principles on Health Care Supply (in part)**
Federal (Stark) limitations on physician self-referral are sufficient and the current exceptions, including the in-office ancillary exception to physician self-referral laws, should be maintained. (BT-3/06)
 - **240.06 Conflicts of Interest**
The MMA approves the following: 1. Support state legislative and rulemaking efforts pertaining to the issue of conflicts of interest that are not more restrictive than the federal Medicare anti-kickback statute and safe harbor regulations. 2. Support state legislative and rulemaking efforts pertaining to the issue of conflicts of interest that provide adequate safeguards for preventing abuse by physicians who refer to entities in which they have a financial interest. (1992-09)
7. The MMA supports the development, dissemination, and

- implementation of appropriateness criteria (i.e., guidelines) to improve the delivery of evidence-based imaging services.
8. The MMA urges specialty societies to continue to develop guidelines to support evidence-based delivery of imaging services. In the event that guidelines from different societies conflict or overlap, the MMA urges the development of a collaborative inter-specialty process to reconcile differences.
 9. The MMA supports the use of decision-support tools to improve the appropriate delivery of high-tech imaging services, but urges review of the long-term return on investment for decision support as it may be variable across physician practices.
 10. The MMA recognizes the value of valid and transparent imaging accreditation programs/processes, but does not support accreditation as an absolute criterion given concerns about access to care in certain geographic areas.
 11. The MMA continues to oppose the use of utilization review/prior notification as a tool to mitigate high-tech imaging utilization and supports a moratorium on its expansion.
 12. The MMA supports efforts to develop meaningful and valid comparative price information for imaging services.
 13. The MMA will work with Minnesota Community Measurement to develop and publish meaningful quality metrics for imaging services.
 14. The MMA recognizes the role of patient demand/expectations on the utilization of imaging services and supports efforts to incorporate reasonable financial cost-sharing arrangements into insurance benefit design, consistent with MMA policy for an essential benefit set.
 15. The MMA will promote efforts to educate the public regarding the risks to health and safety associated with inappropriate use of imaging services.
 16. The MMA will develop resources for physicians describing the relative radiation exposure risks associated with various imaging services.

APPENDIX A: MMA IMAGING TASK FORCE MEMBERS

The MMA acknowledges the thoughtful participation and the investment of time and energy provided by the following members of the MMA Imaging Task Force (the report and its recommendations are the work of the MMA and may not reflect the opinions of individual task force members):

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APPENDIX B: SELF-REFERRAL IN THE LITERATURE

Year	Conclusions	Author(s)	Citation	Data Set
UTILIZATION DATA				
1972	<p>Patients >65 of self-referring non-radiologists were twice as likely to have an imaging procedure performed as patients of non-self-referrers.</p> <p>Patients of self-referral MDs had 65% more procedures than counterparts.</p>	Childs AW & Hunter ED.	Non-medical factors influencing use of diagnostic x-ray by physicians. <i>Med Care</i> 1972; 10:323-335.	6,902 patients >65 years of age and 763 physicians
1998	Non-radiologists with imaging facilities on-site had 1.2 to 1.7 times as high rates of utilization, depending on specialty, as those without such facilities.	Radecki SE & Steele JP.	Effect of on-site facilities on use of diagnostic radiology by non-radiologists. <i>Invest Radio</i> 1990; 25:190-193.	Based on a 1978 national random sample survey of MDs
1990	Self-referring physicians performed imaging 4.0 to 4.5 times as often and generated mean imaging charges per episode of care that were 4.4 to 7.5 times higher than radiologist-referred physicians.	Hillman BJ, Joseph CA, Mabry MR, Sunshine JS, Kennedy D, Noether M.	Frequency and costs of diagnostic imaging in office practice: a comparison of self-referring and radiology-referring physicians. <i>N Engl J Med</i> 1990; 323:1604-1608.	Insurance claims for employees (and dependents) of several large US corporations; used episodes of care for unit of analysis, large sample size, case mix control
1992	Self-referring physicians found to use imaging 1.7 to 7.7 times as frequently as those referring to radiologists	Hillman BJ, Olson GT, Griffith PE, et al	Physicians' utilization and charges for outpatient diagnostic imaging in a Medicare population. <i>JAMA</i> 1992; 268: 2050-2054.	Claims from 119,000 United Mine Workers of America beneficiaries; broader range of clinical presentations than 1990 study

Year	Conclusions	Author(s)	Citation	Data Set
1994	<p>Physicians who were investors in diagnostic imaging centers referred their patients more frequently for tests such as MRI (~3x), CT (~2x), and (-44.5 to 5.1x) for echocardiography, diagnostic nuclear medicine, and ultrasound, than non-owners.</p> <p>The study also concluded that physicians with imaging equipment in their office or group practice ordered tests more frequently than physicians who referred patients to facilities outside their practices. The report did not control for the health status of patients treated by each physician or address whether the additional services were appropriate or not.</p>	GAO	<p>Government Accountability Office. 1994. Medicare: Referrals to physician-owned imaging facilities warrant HCFA's scrutiny, no. GAO/HEHS-95-2. Washington, DC: GAO. October.</p>	1990 Medicare claims for imaging services in FL (-16,000 physician services) - compared use by Florida physicians who invested in joint-venture imaging centers with referral rates of others.
2001	<p>Statistically significant higher rates of imaging among self-referring physicians for patients with respiratory symptoms.</p> <p>No statistically significant differences in imaging use among self-referring physicians for patients with symptoms of lower back pain.</p>	Wilson IB, Dukes K, Greenfield S, Kaplan S, Hillman B.	<p>Patients' role in the use of radiology testing for common office practice complaints. Arch Intern Med 2001; 161: 256-263.</p>	650 elderly patients with respiratory symptoms (522 patients with symptoms of lower back pain) seen in 52 physicians' offices in 8 states. Adjusted for patients' own perceived needs for radiologic tests and for some case mix and socio-demographic characteristics.

COST DATA

1991 & 1992	<p>No major differences in charges and payments found, although some minor tendencies for self-referrers to be more expensive</p>	<p>Levin DC, Edmiston RB, Ricci JA, Beam LM, Rosetti GF, Harford RJ.</p> <p>Levin DC, Edmiston RB, Rosetti GF, Beam LM, Harford RJ</p>	<p>Self-referral in private offices for imaging studies performed in Pennsylvania for Blue Shield subscribers during 1991. Radiology 1993; 189: 371-375.</p> <p>Disparities in reimbursement to radiologists and non-radiologists for 65 common outpatient imaging studies. Radiology 1992; 185: 701-704.</p>	<p>Limited data, investigated prior to widespread adoption of fee schedules for imaging services.</p>
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Year	Conclusions	Author(s)	Citation	Data Set
QUALITY DATA				
(Accuracy of interpretation, technical quality of image, quality and condition of equipment, records management, and patient safety)				
1995	Radiologists interpretations more accurate (74% vs. 55%) more sensitive (62% vs. 38%), and more specific (86% vs. 72%); 82% of “critical” cases interpreted correctly vs. 48% for ED physicians.	Scott WW, Bluemke DA, Mysko WK, et al.	Interpretation of emergency department radiographs by radiologists and emergency medicine physicians: teleradiology workstations versus radiograph readings. <i>Radiology</i> 1995; 195:223-229.	120 radiographs evaluated by consensus panel of radiologists and ED physicians at 1 hospital
2000	Radiology residents’ interpretations more sensitive than those of ED faculty, but as accurate and as specific	Eng J, Mysko WK, Waller GER, et al.	Interpretation of emergency department radiographs: a comparison of emergency medicine physicians with radiologists, residents with faculty, and film with digital display.	120 radiographs evaluated by consensus panel of radiologists and ED physicians at 1 hospital
1995	39% non-concordance between attending physicians and radiologists in interpretations of 555 CT scans	Alfaro D, Levitt MA, English DK, Williams V, Eisenberg R.	Accuracy of interpretation of cranial computed tomography scans in an emergency medicine residency program. <i>Ann Emerg Med</i> 1995; 25:169-174.	555 CT scans from patients seen at ED of a county medical facility
1998	83% accuracy of interpretation of cranial CT scans among neurologists and radiologists and 67% among ED physicians. 52% of radiologists, 40% of neurologists, and 17% of ED physicians correctly identified hemorrhage wherever it was present.	Schriger DL, Kalafut M, Starkman S, Krueger NM, Saver JL.	Cranial computed tomography interpretation in acute stroke: physician accuracy in determining eligibility for thrombolytic therapy. <i>JAMA</i> 1998; 279: 1293-1297.	Convenience sample of 15 cranial CT scans by 103 physicians at a university teaching hospital in which clinical findings were pre-identified by authors
1999	Clinically significant differences in interpretation between ED physicians and radiologists were found in 1.1% of 2,083 radiographs.	Klein EJ, Koenig M, Diekema DS, Winters W.	Discordant radiograph interpretation between emergency physicians and radiologists in a pediatric emergency department. <i>Pediatr Emerg Care</i> 1999; 15:245-248.	Prospective cohort study at a pediatric ED in 1995-1996

Year	Conclusions	Author(s)	Citation	Data Set
1996	Eight-tenths of 1% of 15,585 consecutive radiographs interpreted by attending ED physicians were not interpreted correctly according to review by attending radiology staff; fewer than half of those were considered clinically significant.	Brunswick JE, Ilkhanipour K, Seaberg DC, McGill L.	Radiographic interpretation in the emergency department. <i>Am J Emerg Med</i> 1996; 14: 346-348.	15,585 consecutive radiographs in a Pittsburgh community hospital.
1996	ED physicians and radiologists interpreted differently 134 (0.95%) of 14,046 radiographs; Two-tenths of 1% were clinically significant.	Nitkowski LA, O'Connor RE, Reese CL.	The rate of clinically significant plain radiograph misinterpretation by faculty in an emergency medicine residency program. <i>Acad Emerg Med</i> 1996; 3: 782-789.	14,046 radiographs obtained at two teaching hospitals during a 6-month study
1998	ED physicians were confident in 58% of 16,410 radiographs; discordant interpretations found in 3.1% of 6,811 radiographs for which the ED physician was not confident and in 1.2% of those for which the ED physician was confident.	Lufkin KC, Smith SW, Matticks CA, Brunette DD.	Radiologists' review of radiographs interpreted confidently by emergency physicians infrequently leads to changes in patient management. <i>Ann Emerg Med</i> 1998; 31: 202-207; erratum, <i>Ann Emerg Med</i> 1998; 32: 390	16,410 consecutive radiographs in a MN urban teaching hospital and a community non-teaching hospital
1989	5% of 1,872 consecutive radiographic interpretations by ED physicians were discrepant with the interpretations by 2 radiologists. 65% (1219) of ED physicians rated their level of confidence in interpretations as very; 29% as moderately; 5% as mildly, and 1% as not.	Mayhue FE, Rust DD, Aldag JC, Jenkins AM, Ruthman JC.	Accuracy of interpretations of emergency department radiographs: effect of confidence levels. <i>Ann Emerg Med</i> 1989; 18: 826-830.	1,872 consecutive radiographs in an Illinois teaching hospital
1996	Orthopedist's review of radiologists' reports of fractures found that 15% of 145 studies of fractures without implants were omitted or were in error; radiologists did not describe fracture alignment in 9% of studies and erred in 6% of fracture displacement descriptions. Descriptions of orthopedic implant type, effect, position, and stability were in error or absent for 32% of the relevant details in the 226 studies with implants.	Clark R, Anderson MB, Johnson BH, Moore DE, Herbert FD.	Clinical value of radiologists' interpretations of perioperative radiographs of orthopedic patients. <i>Orthopedics</i> 1996; 19: 1003-1007.	Four members of a Utah hospital's orthopedic staff reviewed radiographs and written radiologists' reports for studies of fractures with and without implants.

Year	Conclusions	Author(s)	Citation	Data Set
1984	More than half of the exams performed by self-referring physicians did not meeting guidelines established by the American Institute of Ultrasound in Medicine, ACOG or ACR.	Rosenfeld RH.	Market forces set off skyrocketing interest in hospital-doctor ventures. Modern Healthcare 1984; 4: 60-64.	69 freestanding radiology centers, 31 Ob/Gyn offices, and 27 hospitals in NJ and PA to which US Healthcare sends patients.