THE CAR GUIDE TO
PEER REVIEW SYSTEMS

CAR

Canadian Association of Radiologists
L'Association canadienne des radiologistes

The CAR Guide to Peer Review Systems

September 10, 2011

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This document outlines the requirements for peer review processes and suggests how such processes can be integrated into practice, ideally adopted and standardized nationally and provincially.

"We don't study routine failures in teaching, in law, in government programs, in the financial industry or elsewhere. We don't look for the patterns of our recurrent mistakes or devise and refine potential solutions for them."

– Atul Gawande MD

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1. Introduction

Quality assurance in medical care is a critical issue as medicine has become extremely complex at the start of the twenty-first century. Avoidable discrepancies are persistent and common in medicine because of this complexity and the breadth of knowledge required to deliver its benefits (1). The Institute of Medicine diagram of medical competencies shows patient–centered care at the core surrounded by informatics, evidence-based medicine and quality improvement. (2). Today's good doctors should see process improvement and reduction of failures as one of their core competencies (3). In a patient-centered world communication must be efficient, the interpretations correct and the process to achieve this transparent (4).

Radiology is at a crossroads of rapid technological advance and globalization; with the advent of PACS and off-site on-call service provision, radiologists need to embrace quality assurance not only to safeguard patients but to safeguard their own profession. Regulators are becoming increasingly anxious to define acceptable levels of performance amongst radiologists given the occurrence of a number of recent cases where inadequate reporting and medical adverse events have occurred (5). Given performance in practice can be more easily assessed in radiology than in many other medical specialties, we have the opportunity to shape the form quality assurance should take and maintain the value of our expertise. Incorrect interpretation of studies is the leading causes of malpractice suits against radiologists (4,6,7). However, there are numerous avoidable radiological discrepancies that occur on a daily basis that can be addressed by a more careful scrutiny of process and outcomes. Some have stated that radiologists now have an obligation to monitor these outcomes and make our results public (4). In our demanding and busy work environment it is important that Quality Assurance (QA) is integrated seamlessly into our daily workflow. Comprehensive QA programs include many facets such as professional performance, process improvement (efficiency), patient safety, patient satisfaction and professional outcomes assessment (8). Peer review is an important component of radiologist performance assessment and can be achieved through the use of integrated software tools that link with the radiology information system (RIS) and the Picture Archiving and Communications System (PACS). These tools must allow easy collection, analysis, display and reporting of the data (9).

Despite high levels of training and expertise it will still be possible for radiologic discrepancy to occur even in the best settings. The Canadian Medical Protective Association (CMPA) states that "an important part of a just culture is learning from adverse events and close calls" (10). There have been many attempts to define an acceptable level of radiologic discrepancy but this is probably futile as there are multiple variables at play and the distinction between acceptable discrepancy and negligence remains extremely blurry (11). The purpose of a peer review program is not to define such parameters; peer review aims to improve overall standards by defining unperceived discrepancies and educational needs within the subject group. In this way, radiologists can start to contribute to the health care revolution of the early twenty-first century that will be one of improved patient safety and outcomes.

It has been stated recently by Larson and Nance (12) that peer review can either serve as a coach or a judge, but it cannot do both well. In an analogy to the airline industry these authors make a case for the shift away from focus on the individual to the overall improvement of systems and patient care. They call for a move away from blame culture to one of ongoing feedback, learning from mistakes, education, deliberate practice and system based solutions. Peer review is a qualitative rather than a scoring or quantitative process. Unfortunately the recent literature and many regulators are incorrectly emphasizing the scoring aspects of the tools available (13, 14). Many more tools than retrospective peer review are available including checklists (1), double reading, and computer-aided detection. However if we implement peer review it must be done in such a way as to improve care rather than track individual radiologist's discrepancy rates. (12)

2. Peer Review and Some Definitions

Peer review is a generic term for a process of self-regulation by a profession or a process of evaluation involving qualified individuals within the relevant field. Peer review methods are employed to maintain standards, improve performance and provide credibility.

A peer review process is typically used within the umbrella of a radiology department's overall quality assurance program. Peer review is ideal for measuring radiologists' skills as it essentially evaluates the end product of our work by having a colleague reviewer correlate an exam with his/her peer's report. A multiple-choice exam may assess knowledge but impact on patients is observed far more directly by peer review. Peer review does have a significant requirement on the reviewers' time, but when coupled to a comprehensive educational program, peer review can have significant benefits for a department embarking on QA.

A **reporting discrepancy** occurs on retrospective review of a radiologic study or when other subsequent information comes to light that leads to a differing opinion than that expressed in the original report. Not all are "errors" as causes vary from inadequate clinical information and poor imaging technique to radiologist factors that include workload, working conditions, observation/interpretation discrepancies, and poor reporting structure such as vagueness or ambiguity. Indeed the CMPA advises against the use of the term "error" as this has a pejorative implication. The term may be misunderstood and promotes a punitive culture reducing the chances of active learning from adverse events. Peer review attempts to identify a percentage of these discrepancies and provides educational and quality assurance related to these cases in order to minimize repetition.

Performance-based assessment in radiology requires involvement of radiologists to assess the work of their colleagues. Systems that rely mostly on review of the prior imaging studies for an assessment when the reviewing radiologist is required to report the latest study will be called **retrospective or reactive** peer review (an example is the ACR proprietary software called RADPEER™ which is a Workstation Integrated Peer review system) (9,13,14). Another retrospective method is the submission of cases on digital media such as CD-ROM or via a linked PACS to a regulatory body, as it is currently handled in Saskatchewan, for example. Review of discrepancies retrospectively can introduce hindsight bias and other biases that should be recognized as a potential pitfall (15).

Having two radiologists assigned to review a case randomly before the final report is sent out would constitute **prospective or proactive** peer review. An example of this might be a second reading CT colonography protocol where reader A is the dictating radiologist but waits until reader B submits her findings on a worksheet and collates this with his findings before completing his final report. Various biases are minimized but it is potentially possible for two readers to make the same discrepancies.

Peer review should be incorporated into daily workflow to maximize participation. If such review and feedback is conducted continuously, results can be monitored by department or section heads for their effect on performance. There is significant educational value in review of the discrepant cases but for comprehensive review there must be full participation by the group. The hope is that performance will subsequently improve. The peer review process must be standardized and must allow easy participation in order to be meaningful. It has to be fair and non-punitive with an emphasis placed on educational opportunity rather than merely trying to identify possible poor performers or "outliers". Improvements can be anticipated both on individual and departmental levels. However the standard RADPEER™ type peer review is not without its critics with some authors from the Mayo Clinic, a hallmark in quality, questioning whether this information translates into widespread learning or improvements in clinical skill (8).

This document will outline the requirements of a peer review process and how such a process can be integrated into practice, ideally adopted and standardized nationally and provincially. Regardless of the processes chosen by any individual institution or group of radiologists it is vital that there is a properly constituted Quality Improvement Committee in place. This type of committee guarantees that the use and reporting of the data is protected and used only for quality improvement and not by other hospital departments, patients or their legal representatives. If this protection is not afforded from the outset then radiologists will be unwilling to participate.

3. Methods of Radiologist Peer Review

3.1. Workstation integrated peer review

A. This method is retrospective and requires no additional reading of examinations review of the relevant prior study

B. Minimal interruption is facilitated by using proprietary software that should integrate seamlessly into the radiologists' workflow

C. Generally the reviewing radiologist evaluates the report of the peer radiologist who read the relevant prior examination

D. This method allows data to be collated and used for education, revalidation and other regulatory purposes

E. Protection of the data is an important medico-legal issue addressed later in this document and the law relating will vary from province to province

F. There may be bias or suppression in the data collection if correct anonymisation procedures are not followed. Similarly if punitive measures are feared as a consequence of unfavourable peer reviews, compliance may be affected

Workstation-integrated peer review systems

The American College of Radiology's RADPEER™ program is an example of a workstation-integrated peer review system and has been used more extensively than most other similar processes (13). It is reactive in that it involves review of a previous report by another radiologist in the course of reporting subsequent examinations for a particular patient (9,13,14). Many new vendors are now entering the market and CAR cannot comment on all of these products. For the purposes of this document RADPEER™ will be considered a generic product as it was the original software tool.

RADPEER™ program was offered to ACR members from 2002 after pilot studies (13). It was designed as a simple cost-effective peer review that can be performed during the routine interpretation of current images. If prior images and reports are available at the time a new study is being interpreted, the prior studies and the accuracy of the report can be evaluated and scored by the current interpreter on a standardized 4-point rating scale (14).

Scoring systems

A classification of peer-review findings with regard to level of quality concerns (e.g. 4-point scoring scale) is required. Detailed examples of scoring are included herein for reference (see Appendix).

The original scoring system developed was 1 "Concur with Interpretation", 2 "Difficult diagnosis not ordinarily expected to be made", 3 "Diagnosis should be made most of the time", 4 "Diagnosis should be made almost every time-misinterpretation of findings". A web-based system is now used for data input. Summary data is generated by radiologist, modality and facility. In a review up to December 2007 collated data showed: Score 1 - 97.11 % of cases; Score 2 - 2.51%; Score 3 - 0.32%; and Score 4 - 0.07%.

With a total "disagreement" rate of only 2.9% the question arises as to whether RADPEER™ truly reflects the quality of reporting or whether there is a reluctance to assign less than a perfect score to colleagues. Because of these and other issues ACR struck a review task force in 2007 to reevaluate RADPEER™ and the scoring system (14).

Based on a move in the literature towards outcomes (16) the task force proposed a change allowing the reviewers to add an option for either unlikely (A) or likely (B) to be of clinical significance in Scores 2-4. Melvin et al (16) used 0 No discrepancy, 1 Minor discrepancy (incidental to treatment/management), 2 Significant discrepancy (affects treatment/management, not outcome), 3 Major discrepancy (affects outcome).

The ACR task force recommended the same numbers as the original RADPEER™ system but changed definitions. Score 2 has been changed to indicate that it represents a discrepancy, but the finding is difficult enough that it is an understandable miss. Score 3 has been changed to "substantial discrepancy in interpretation" and score 4 to "major discrepancy in interpretation". Together with the A and B significance categories this gives a more "harm based" scoring system paralleling schemes like the Pennsylvania Patient Safety Reporting System. Overcalls leading to unnecessary additional tests or interventions can also be scored as a partial harm in this system. RADPEER™ recommends all 3 and 4 scored cases be reviewed locally by the appropriate committee. Examples are given in the appendix (from Jackson et al (14)).

Newer Systems

There are now several newer RIS/PACS integrated peer review systems available, which offer some additional advantages or other QA features. The scoring system and data collection parameters can be adapted to local needs by working with the vendor and other stakeholders. This document cannot recommend a specific vendor but examines some of the advantages and pitfalls in choosing such a system for departmental peer review.

Any adopted workstation peer review software must allow for a fair, unbiased, and consistent process. Opinions of both reviewers and radiologists being reviewed must be recorded with minimal effect on workflow, to allow easy participation.

The software must allow analysis of the collected data. Aggregate data must help identify trends to reveal opportunity for quality improvement in a non-punitive environment. Individual outcomes should be tracked and should demonstrate improvement over time, ensuring competence and patient safety.

Selection of Cases

There are two main methods of case selection. In a manual selection only, discrepancies are reported back down stream when discovered during normal reporting. Some vendors refer to this method as ad-hoc or "on –the-fly" review. In random selection of cases the software is programmed for the agreed upon level of QA. Cases are then assigned to the worklist of a radiologist, who was not the initial reader, randomly during the workday. Those cases are then scored on the agreed upon scale: both methods can be used together. There are many questions regarding the selection of cases and how this should be achieved (9). Unfortunately at the present time there is no good data on validity, reliability and reproducibility of results derived from these systems (9).

Peer review software can be programmed to perform random selection of cases broadly representing the work done in a department and by individual radiologists being reviewed. Review must occur on a regularly scheduled basis. Examinations and procedures representative of the scope of practice/specialty of each physician must be selected.

Summary data for each institution or group practice by modality should be available. Manual selection of cases for technologist QC notification and for QA rounds or teaching files may be included.

Ideally the system should be able to communicate with databases where pathology reports can be retrieved but this may place complex IT demands on the system (17).

There is no consensus or evidence-base regarding the required percentage of studies to be reviewed (9). However, crucial to this metric is the need to respect radiologist workflow and time constraints that puts an absolute limit on the retrospective method.

3.2. Discrepancy Meetings

A. Occur within a group or several groups of radiologists

B. As a part of a multidisciplinary team such as an oncology tumour review board, this may be effective where small radiology groups operate

C. Requires careful planning and execution as below

D. Can be linked with Workstation Integrated Peer review

The RCR UK standards document forms an excellent review of the literature and sets down standards for the setting up of such meetings (15). These include the appointment of a convener to produce a non-confrontational environment that allows the learning aspects to dominate rather than a "blame game" culture.

Case collection should be well organized and robust to minimize sampling discrepancies. Anonymity should be preserved, such as a secure e-mail to the convener or a purpose built system within a PACS protected by local hospital bylaws or provincial legislation after consultation with the hospital lawyers.

Cases should also be sourced from the formal peer review system as well as local clinicians. False positives as well as false negatives should be included. Standardized logbooks or forms should be used and the meeting conducted in as anonymous a way as possible with the clinical outcomes and other facts of the case presented by the convener. Learning and action points should be discussed and agreed upon. Discrepancies can be graded on a scale of difficulty. If a discrepancy has occurred then it should be fed back to the colleague concerned even if that radiologist does not work in the same hospital or is a locum, together with a short summary of the discussion from the meeting. The clinical team may well already be aware that any patient communication needs to be handled carefully

with no intent of concealment, complying with the CMPA handbook on disclosure (18). The radiologist concerned may have already been notified and issued an addendum report but if this has not been done the meeting will need to make a decision on any possible action required. Radiologists are advised to consult the CMPA's handbook on disclosure (18). Numerous biases are inherent in any attempt to review discrepancies as listed in the RCR report (15). These include selection bias, sampling bias, hindsight bias, outcome bias, attendance bias and variation.

The RCR's final recommendations include meetings every 2 months, a formal process for reporting the outcomes, confidential feedback, an annual report and a fixed term and election process for the convener. Regular attendance at discrepancy meetings is desirable together with a written record of attendance. If the radiologist did not attend, alternatives such as written evidence of feedback from clinical colleagues may be acceptable. A minimum of 50% meeting attendance with the attendance records available to administrators is desirable (15).

3.3. Double Reporting sequentially in the same department prior to issuing a report

A. Time consuming unless a system can be designed where the process integrates seamlessly into the PACS. Turnaround time (TAT) may be affected

B. May apply to some specific domains e.g. screening mammography, the training of CT colonography or coronary CTA readers

C. Not widely used as a peer review tool but often used diagnostically as in some screening mammography programs and in resident training

D. Has the advantage that it is a "prospective" system that therefore does not have some of the same issues regarding data protection and reissue of reports (addendums) needed in retrospective review systems like RADPEER™

E. May require a relatively high proportion of second reads to be effective

F. Certain biases are removed but there is no guarantee that a second reader will not produce similar or different discrepancies

Double reporting can allow assessment relative to a peer review but is potentially time consuming and has traditionally only applied in areas of high complexity such as mammography and CT colonography, but it does allow some discovery of discrepancy rates between individuals. Some of the newer software products now offer this model in randomized formats that allow immediate feedback to the original reporter and a rapid resolution to allow minimal turnaround time penalties.

Double reporting of CT colonography or CT coronary angiography can be used where there are readers of differing experience levels who might be in training. In one study novice colonography readers were brought up to a required standard by having approximately 175 cases verified on a computer training program acting as a second read (19).

In examples of older screening studies (20,21,22) rather high rates of return on the second reading have been reported but these were historical studies, mostly using analogue techniques, designed to answer specific questions about breast and lung cancer screening. These studies cannot be used to justify routine second reading but nevertheless do provide some evidence for the value of a second read in selected circumstances. Thus double reading has potential to be an effective tool for quality and educational purposes and avoids some of the legal and administrative pitfalls of reactive peer review such as the need to issue addendum reports. Satisfactory workstation integration requires that the time penalty on issuing reports must be minimized. The same methods can be applied to resident or fellow training, so called "proctored review".

3.4. Feedback from a tertiary care center to a community hospital

A. Requires care and attention to the sensitivities of the local community radiologists

B. Requires attention to the differences between expected standards for the subspecialist and the community radiologist

C. May require establishment of careful communication pathways to protect the information appropriately

D. Has the potential to be very helpful and educational for the general radiologist and should not be ignored for sociologic reasons

This type of peer review will depend upon local referral patterns in any given region. It may be particularly helpful in defining what the referring clinician needs to know prior to sending the patient to a tertiary center. Examples might include neurosurgical, paediatric and oncology referrals. Consideration must also be given to workload issues and ensuring that subspecialist radiologists themselves have a mechanism for feedback on their own performances. This may be challenging as in any centre the number of a given sub-specialty group may be limited so peer review for these radiologists may have to be managed on a provincial or national scale.

A reverse strategy is the use of software by community radiologists to rapidly obtain a second sub-specialist opinion using real-time chat functions and the like. Whilst not strictly peer review this does enable the referring radiologist to evaluate his/her own knowledge base and perhaps define future structured learning projects within the Royal College MOC program.

3.5. Submitted peer reviews using a regulator

Where radiologists work in isolation or where there are radiologists working in situations where they do not have full certification (e.g. remote rural areas) it may be necessary for the peer review process to be entirely supervised by the local College or equivalent regulator.

The College of Physicians and Surgeons of Saskatchewan (CPSS) currently uses this method. Under their bylaws the health authorities must participate in the program that is government funded but administered by the CPSS. Physicians are randomly selected on a five-year cycle and a cohort of images are submitted or pulled from a linked PACS (the auditors can be given passwords). Feedback is given to the audited radiologists with explicit recommendations for future improvements. This includes image quality and other aspects of the exam as well as the report. Where the committee considers that the quality of the work is suboptimal but not unsafe, it orders a short term re-audit to ensure recommendations have been implemented.

If there are further concerns these are reported to the Registrar who implements the statutory public protection tools of the College including a full audit of the registrant's work. The full audit may be carried out by out-of-province radiologists to avoid conflicts of interest. The committee then makes a judgment as to whether the variance observed is a true indication of unsafe practice.

3.6. Comparison of reports to a reference standard

A completely different method compares the report with a reference standard, such as an MRI report with a knee arthroscopy, or a CT coronary angiogram report with catheter derived information. This type of data can be more meaningful and has been used in breast imaging for some time. The British Columbia Screening Mammography Program provides an excellent template for such notification and remediation. Data from screeners are compared to the reference standards. Metrics can be generated on percentage of positive biopsies and cancer detection rates to allow comparison with the peer group. These types of metrics have advantages over the retrospectively collected types of discrepancies because they are outcome based (8).

4. Mentorship and Remediation

The coordinator of the discrepancy meeting is in a position to supervise overall re-education and outcomes from the process. Subsequent review of discrepancies with the original report by a third party is needed including surgical or pathologic findings (i.e. assess congruence).

Policies and procedures must be developed to allow action to be taken on significantly discrepant peer-review findings for the purpose of achieving quality improvement. Such systems might include a discrepancy meeting where only the higher-level (ACR level 3 and 4) cases are discussed.

Confidential notification of reporting/reviewed radiologists with comparison of individual results to aggregate group statistics can be provided. Such tools can help recognize gaps in quality so that a focused intervention can more effectively address the problem and improve patient care (17). The coordinator using the database should track all critical issues and make sure that communication loops are closed.

Data derived from peer review can be part of a department's balanced scorecard to help drive overall departmental performance (23).

4.1. Accountability Reviews

Generally, peer review is not focused on the individual. Rather, its aim is system improvement and feedback where appropriate to help radiology groups manage overall reporting accuracy and other quality improvements. In rare cases, an accountability review may become necessary. Unlike a quality improvement or peer review, an accountability review focuses on the conduct or performance of an individual radiologist. This type of review generally arises in response to a concern that a radiologist's performance may be the main cause of an adverse event. Should concerns about an individual's performance arise during the quality improvement committee process, the review should be halted and leadership asked to deal with these concerns in a completely separate accountability review. It is likely that there will be a process in place already for dealing with such events.

It is acknowledged that in some provinces, for example, Saskatchewan, the College is involved in quality improvement processes by means of regular audits. In these situations this role of the College must be clearly distinguished from its role in disciplining physicians. In other words, the information used for the quality improvement program should in no way be used by the College for disciplining physicians.

Indeed, information about an individual physician should only be disclosed to a College where it is required by the law, where the radiologist consents to the disclosure, or where the disclosure is necessary to protect against an imminent risk to patient safety.

Radiology departments may wish to set up internal policies understood by all their members as to when an accountability review might happen. Particular situations that could adversely affect a member's work and thus trigger an accountability review might include substance abuse, onset of severe mental or physical diseases, or burnout. These are clearly situations that must be discussed with the individual and an appropriate plan decided upon with that radiologist's leadership/management. Radiologists are encouraged to contact the CMPA for advice in circumstances where an accountability review is conducted. A clear plan should be devised for the individual concerned with defined learning objectives and a staged return to work plan. An approach that favours remedial action and education is encouraged. Discipline and other sanctions should only be used if appropriate.

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4.2. Practice-Based Learning following a peer review

The usual situation for most radiologists will involve some input into personal learning projects and life-long learning strategies. This can be as an individual or as part of the radiology group.

Individual radiologist team members' responsibilities include

- Identifying strengths, deficiencies and limits in knowledge and radiologic expertise
- Setting learning and improvement goals and integrate integrating them into Maintenance of Certification (MOC) program
- Identifying and performing appropriate learning activities
- Using the peer review and other methods such as audits to improve overall practice and implementing changes where appropriate
- Using evidence-based materials and methods where appropriate
- Making full use of information technology in these tasks to optimise learning
- Passing on the gains to help educate patients, residents, peers and other health professionals

This process is probably best commenced at the resident stage so that peer review is integrated early and becomes part of common practice. These concepts should be included in the residents' curricula at an early point so as to facilitate implementation and acceptance.

Group benefits following peer review include

- Coordinating patient care by allowing comparison of outcomes from the group members
- Incorporating the best practices from individuals into the group which might include cost-awareness and risk-benefit analysis (e.g. radiation reduction)
- Advocating as a group for better care algorithms
- Working as a team to enhance patient safety and improve quality
- Participating as a team in identifying system adverse outcomes and implementing potential system solutions.

Adapted from ACGME outcomes project (24)

5. Medico-legal Issues

There are many issues surrounding protection and confidentiality of the data generated in a peer review process. Cases can be made anonymous and the readers blinded as to the identity of the original reporter but this may not satisfy certain regulators. There could also be an issue regarding how the program is funded and conflicts may arise on protection of data if the program is funded by a regulator and not structured around a typically protected hospital quality review committee. Furthermore the rights of the radiologist being reviewed need to be balanced with the needs of the hospital for patient safety. The potential abuses of data from a peer review process in this regard have been well addressed in an article by Berlin (25). Where a review is not structured in accordance with the relevant legislation, radiologists are encouraged to seek assurances in writing from management/leadership that the review process is intended to remain confidential and discussion and disclosure of information will be restricted. While it is preferable that peer reviews be conducted under the auspices of a properly constituted quality improvement committee, other forms of legal privilege (e.g. solicitor-client, litigation and/or common law privilege) may be applied to protect the peer review process. Radiologists should be aware, however, that if the review is not protected by legislation, the management/leadership may not be able to guarantee any protection of the information.

According to a CMPA article "legislation in each Canadian province or territory protects quality improvement information, deliberations, records and documents from being disclosed in legal proceedings" (10). The relevant legislation generally only requires that quality improvement committees have the broad purpose of improving overall quality and hospital care. Radiologists can therefore be reassured that this legislation generally extends to radiology peer review processes, even if the quality improvement committee analyzes various radiology studies or consults with other hospitals or radiologists who are located in different jurisdictions. The radiology department should therefore ensure that the hospital has such a committee for dealing with quality improvement. If such a committee exists already a sub-committee could be struck to deal with radiology quality review.

According to the CMPA it is very important to make the distinction between an accountability review and a structured quality improvement program. A properly conducted quality improvement review should focus on identifying system failures and making recommendations for improvement; these reviews should not provide recommendations about individual radiologists.

This is why the correct setting up of the program with discussion between all stakeholders is so vital.

6. Disclosure of Adverse Events

Radiologists have an ethical, professional and legal duty to disclose adverse events in the same way as any other physician. Radiologists are encouraged to consult the CMPA's handbook on disclosure (18).

In order to decide which events should be disclosed it is useful to define an adverse event as "an event that results in unintended harm to the patient and is related to the care and/or services provided to the patient rather than to the patient's underlying medical condition" (18). The term harm is defined as "an outcome that negatively affects a patient's outcome and/or quality of life" (18). Therefore there is a duty of disclosure for events such as a missed diagnosis delaying treatment, mammography causing rupture of a breast implant or image-guided biopsy causing complications. In other words any diagnostic or interventional radiology test that affects a patient's health and/or quality of life in an adverse way should be treated as an event requiring disclosure.

Discovery of such events during either normal daily work or a peer review requires careful handling with regard to the language of reports so as not to cast blame or suggest negligence on the part of the initial reporting radiologist.

For example, the following language could be used:

> "On the current examination, and knowing where to look, a lesion has evolved to the point of recognition. This is a recognized limitation of diagnostic imaging tests."

> "With the benefit of the knowledge I now have and knowing where to look, I note an abnormality has now evolved in the…"

In cases where an obvious lesion comes to light on the previous examination where this is being compared with the current imaging it would be prudent for the radiologist to be forthright but factual in the description. For example:

> "A mass of 3x3x3cm is seen in the left upper lobe. Although not reported previously this measured 2x2x2 m on the image dated…."

Although this practice may place radiologists in a difficult position, the concern is that if these discrepancies are not reported, it would subsequently be difficult to explain why this was not mentioned to the referring physician, if the lesion was obvious previously.

7. Conclusion

Peer review processes will impact radiologist workflow very soon, if they have not already, as health organizations move to a greater period of accountability, transparency and patient safety. Although not perfect, with little evidence on validity and reliability, significant biases and problematic medico-legal issues, peer review is probably here to stay and it behooves the profession to adopt it quickly and adapt it to our needs in order to embrace a patient safety culture. Radiology must ensure that these processes are used correctly to improve systems and clinical care rather than just to track individual radiologist's discrepancy rates (12). This requires system wide approaches and general quality improvement measures against a background of a comprehensive departmental education and quality improvement program.

> "We have to measure and analyse outcomes to define minimal standards and we have to analyse individual errors and near misses to prevent them happening again." Phil Hammond MD (26)

8. TABLES

The following tables reference "Peer Review in Diagnostic Radiology: Current State and a Vision for the Future," to assist in setting parameters when implementing a peer review system. (9)

8.1. Uses of a peer review system

A peer review system can be used...	
A	As part of an overall departmental patient-centered quality improvement program to deliver the best care in the most efficient and safest manner
B	For evaluation and assessment of an individual for purposes of revalidation or recertification by a regulator
C	As an educational tool to allow identification of unperceived needs or deficiencies in training and life-long learning
D	For maintenance by a department, or a section of a department, of a certain minimum level of competence amongst its radiologists or trainee residents and fellows

8.2. Abuses of a peer review system

Peer review systems are considered abusive or punitive when used...	
A	As an evaluation and assessment of an individual purely for purposes of punitive measures by a regulator without an attempt to educate or improve quality
B	As a means of identifying underperformance where the aim is blame and job sanctions or firing by a Health Authority rather than a means of elevating the average quality of care by education and mentoring
C	As a database for lawyers to obtain information about local medical mishaps
D	As a means of defining an average level of medical discrepancy so that this figure can be used as in A and B above
E	To respond to failure to identify significant bias such as hindsight bias and selection bias
F	Maliciously by reviewers or by using peer review data to damage the reputation of a competing radiology group

8.3. Requirements for peer review software

	Good peer review software...
A	Reveals opportunities for quality improvement
B	Helps ensure competence
C	Helps improve individual outcomes
D	Is a fair, unbiased, consistent process
E	Allows trends to be identified
F	Employs random selection of cases broadly representing the work done in a department
G	Ensures the opinions of both the reviewers and the radiologists being reviewed are recorded
H	Is non-punitive
I	Has minimal effect on workflow
J	Allows easy participation

8.4. Items to include in an acceptable peer review program

	When developing a peer review program, ensure that...
A	The process includes a reactive or proactive double reading with 2 physicians interpreting the same study
B	The process allows for the random selection of studies to be reviewed on a regularly scheduled basis
C	Examinations and procedures are representative of the work of each physician's specialty
D	The process allows assessment of the agreement of the original report with subsequent review (or with surgical or pathologic findings)
E	There is an approved classification of peer-review findings with regard to level of quality concerns (e.g. a 4-point scoring scale)
F	Policies and procedures for action to be taken on significantly discrepant peer-review findings are in place for the purpose of achieving quality outcomes improvement
G	Summary statistics can be generated and comparisons shown for each physician by modality to help the coordinator assess performance standards
H	Summary data for each facility or practice by modality can be obtained to aid the departmental QA program
I	There should be a planned strategy for remediation and re-education on both individual and departmental levels when discrepancies arise

8.5. Considerations when using a provincial college as primary regulator

	When considering having the provincial college as the primary regulator for peer review…
A	Radiologists must feel the process is fair with full and frank consultation
B	Any "us and them" blame culture should be avoided (e.g. rural versus urban)
C	All college and any associated government process must be fully transparent
D	The rights and professional standing of members must be protected
E	Any out of province reviews must be conducted by radiology organizations who: • Have their own proven QA process • Have sub-specialist academic radiologist assessors • Understand what is required in a community hospital by generalists • Do not have a conflict of interest e.g. a commercial teleradiology company

9. References

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10. Appendix (from reference 13)

Examples of Scoring in the ACR RADPEER system

Note: Scoring should include both primary findings and incidental findings on the imaging study. Both misses and overcalls can be included.

Score of 1
"Concur with original reading": self-explanatory

Score of 2
"Discrepancy in interpretation/not ordinarily expected to be made (understandable miss)"

A. "Unlikely to be clinically significant"

- Small knee collateral ligament tear (ie, subtle or difficult to appreciate finding)
- Osteopoikilosis that is not clinically significant (ie, esoteric finding)
- 7-mm mesenteric lymph node on abdominal computed tomography (CT)
- Small (5-mm) apical pneumothorax on overpenetrated portable chest radiography after subclavian line placement
- Minimally calcified (<3 cm) abdominal aortic aneurysm on kidney, ureter, and bladder scan
- Old, healed long-bone fracture (ie, apparent on single view)
- Subtle mass (probable benign lymph node) on mammography

B. "Likely to be clinically significant"

- Subtle or early lung cancer seen on chest CT in retrospect (ie, difficult to diagnose prospectively)
- Subtle meningeal enhancement on brain CT or magnetic resonance imaging (MRI)
- Small subdural hematoma around cerebellar tentorium
- Subtle scapholunate separation
- Small minimally radiopaque soft-tissue glass foreign body on hand radiography
- Subtle 1.5-cm pancreatic tail mass
- Early vascular calcifications on screening mammography, recalled for additional imaging (overcall)

Score of 3
"Discrepancy in interpretation/should be made most of the time"

A. "Unlikely to be clinically significant"

- 2-cm bone cyst noted on knee MRI
- Pneumoperitoneum on abdominal film of patient one day after abdominal surgery
- Vertebral body hemangioma on spine MRI
- 3-cm thyroid mass on chest CT
- 5-mm calcified renal calculus without associated hydronephrosis on computed tomographic urography

B. "Likely to be clinically significant"

- Small subdural hematoma on brain CT
- Skin fold interpreted as pneumothorax in newborn with subsequent placement of chest tube
- Asymmetric 2-cm breast mass on chest CT
- 2-cm para-aortic or pelvic lymph node
- Periappendiceal or pericolic fat stranding
- 1.5-cm adrenal mass in patient with lung mass
- Cluster of pleomorphic microcalcifications on mammography
- Pericardial effusion on chest CT
- Short single-segment Crohn's disease on small bowel follow-through examination
- Lateral meniscus tear on knee MRI

Score of 4
"Discrepancy in interpretation/should be made almost every time—misinterpretation of finding"

A. "Unlikely to be clinically significant"

- 4-cm pelvic lymph node in patient beginning chemotherapy for lymphoma
- 2-cm calcified gallstone on CT of a patient with lower left quadrant pain and diverticulitis

B. "Likely to be clinically significant"

- Displaced fracture of base of fifth metatarsal
- 25% slipped capital femoral epiphysis in 12-year-old patient
- Tension pneumothorax
- Large medial meniscus tear on knee MRI
- 3-cm hilar lymph node on chest CT
- 2-cm lung nodule on chest radiography
- "Classic" molar pregnancy on pelvic ultrasound
- Obvious hamartoma on mammography for which biopsy was recommended (overcall)