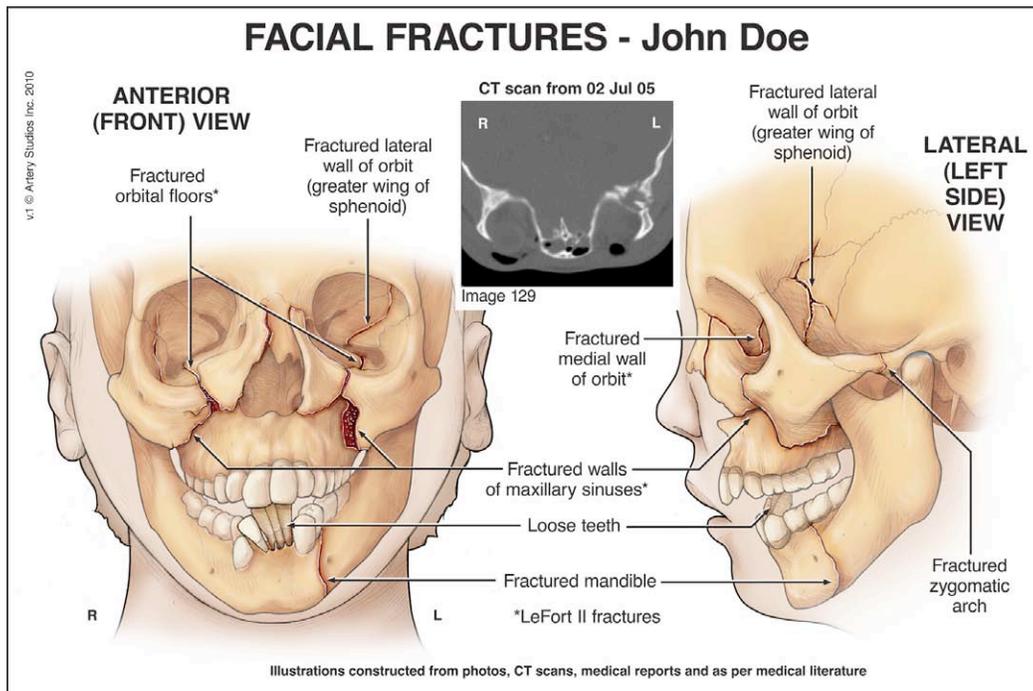


COMMUNICATING COMPLEX MEDICAL ISSUES: A VISUAL APPROACH

Paper presented at the Trial Lawyers Association of British Columbia
Persuasion and the Complex Case – Strategies to Simplify Challenging Medical/Legal Cases
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UNIQUE COMMUNICATION CHALLENGES FOR LITIGATORS

Law schools focus on the art of language use – rulings, legal precedents, salient legal details – all using the written word to ensure accurate interpretation of the law. But few law schools (if any) integrate courses on human anatomy, biomechanics, physiology, radiology, obstetrics or other medical subjects. Most personal injury lawyers are self-taught when it comes to understanding medicine.

X-rays are ubiquitous in healthcare, and many personal injury cases include x-rays in the hospital records. Yet interpreting these accurately requires specialized knowledge and experience, and an ability to visualize anatomical structures three-dimensionally. These diagnostic images capture anatomy in two-dimensions only, with often overlapping structures and critical subtleties not evident to the untrained eye. Yet medical experts often use x-rays alone when testifying – which may be virtually incomprehensible to a lay audience when communicating injury details to the jury (Irwin 1987).

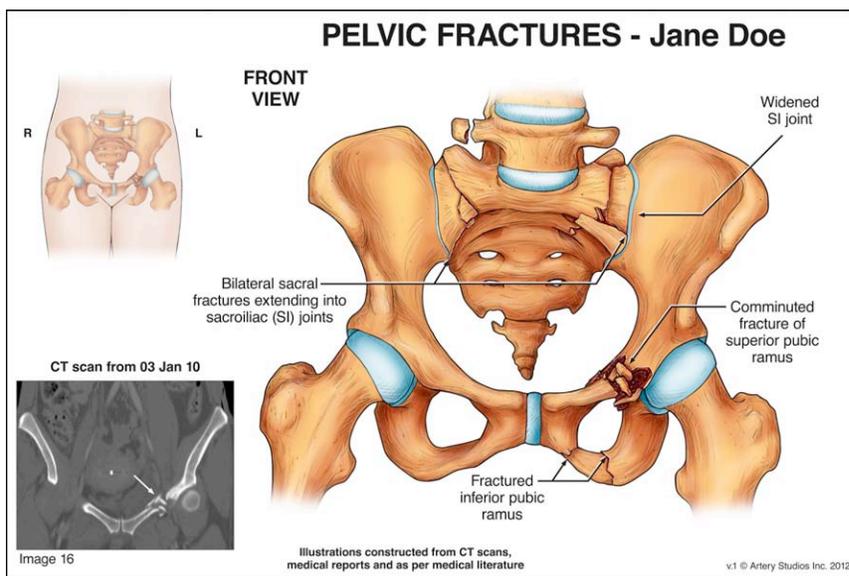


Figure 1: Complex trauma issues such as the details of fractures of the pelvis must be communicated at mediation or other settlement meetings or at trial so that all participants fully appreciate the injury implications.

Radiology, medical reports, operative notes, treatment procedures, pathology, obstetrics – these are complex subjects. And the complex case often has reams of detailed information associated with it. Not only must a personal injury litigator understand the anatomical, surgical, pathological, physiological, pharmacological, functional and other medical and technical issues for a myriad of different files, his or her legal team must all be able to understand the important medical concepts being discussed – often by the injured client during case intake and in subsequent meetings – who may know the specific medical issues related to his or her own body quite well. Getting the entire team onto the same page can be onerous when developing the case.

Then, when arguing the case at mediation, the medical issues must be confidently communicated and the germane issues emphasized, to ensure the mediator has a clear understanding of the severity of the medical factors. At trial, the orchestration of medical experts' testimony must link together to tell a compelling story that holds together from the trauma, surgical and complications perspectives. These issues must also be made memorable to the mediator, adjustor, or judge and jury – argued in a convincing manner during the mediation or in closing so that a fair award is rendered (see Figure 1).

Similar to a doctor communicating medicine to a patient, usually non-medically-trained participants are deciding the merits of the case. Mediators may have little or no knowledge about the medical matter before them, the education level of the jury may vary significantly, and words that are heard (or read) may cause a unique mental picture to be formed in the mind of the decider of fact, that relates in no way to the *actual* medical facts.

All of these factors (see Figure 2) create challenges to arguing and clearly presenting the complex case.

FACTOR	COMPLEXITY ISSUES	NOTES
RADIOLOGICAL DATA		
X-rays	<ul style="list-style-type: none"> • structures overlap • lucencies/opacities need to be interpreted 	
CT/MRI scans	<ul style="list-style-type: none"> • body is imaged in slices – can be confusing • not all negative readings indicate normal • images are displayed as though looking from feet of patient 	
Ultrasound imaging	<ul style="list-style-type: none"> • diffuse/fuzzy appearance • differentiation of structures difficult for non-specialists to appreciate • angles of 'slice' of US wand can be confusing as plane of orientation varies 	
Nuclear scans (e.g., bone scans, SPECT studies)	<ul style="list-style-type: none"> • subtleties of imaging hard to interpret • comparison to normal not evident 	
SPECIALIZED SUBJECT MATTER		
Anatomy	<ul style="list-style-type: none"> • includes neuroanatomy (brain, spinal cord); cardiopulmonary; abdominal; joints; organs 	
Body systems	<ul style="list-style-type: none"> • musculoskeletal; cardiovascular; other 	
Physiological	<ul style="list-style-type: none"> • e.g., healing process; hormonal factors; bone remodelling; blood chemistry 	
Pathology	<ul style="list-style-type: none"> • myriad of disease states • final outcome of client must be appreciated • classification of diseases is complex 	
Surgical	<ul style="list-style-type: none"> • highly detailed; many unique procedures 	
MEDICAL REPORTS		
Hospitals/Physicians/Experts	<ul style="list-style-type: none"> • hospital records (including radiology reports) • fetal monitor recordings • specialist reports (between physicians, etc.) • operative notes • expert reports 	
MEDICAL LITERATURE (RESEARCH)		
Journals/Texts	<ul style="list-style-type: none"> • geared to medically trained audience • specialized • technical jargon 	

Figure 2: Overview of factors of medical complexity associated with personal injury files.

MAKING CASE INFORMATION MEMORABLE: VISUAL LEARNING

Although most of us participated in Show and Tell early in school, we may have forgotten how natural it was to communicate visually while explaining something orally. Research has shown that visuals assist the viewer in perceiving and retaining the information presented (Cooper 1999, Weiss-McGrath 1989).

Legal participants have difficulty absorbing complex information that is delivered only orally (Ferguson 2004). In the Weiss-McGrath report, the authors examined how people best retain information (Weiss-McGrath 1989). In that study, information was presented to individuals in three ways: orally only; visually only; and both visually and orally. The study found a 100% increase in jurors' retention of information when presented visually, versus orally, and a significant 600% increase in retention of information when presented in a combination of visual and oral presentations, over oral presentations alone (see Figure 3). The authors concluded that when information is presented through combined visual and oral modalities, there is significantly increased information retention, for a longer period of time.

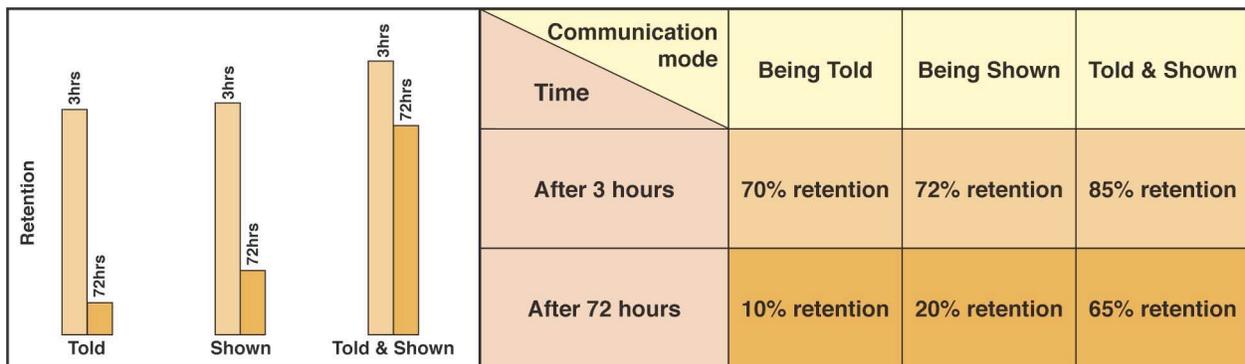


Figure 3: Findings of Weiss-McGrath report, showing the dramatic increase in long-term retention of information when presented to jurors both visually and orally.

By extension of this research, trial efficiency is increased when visuals are used that “... enhance retention of information by the jury, summarize large amounts of information in an understandable fashion, simplify complex information, and assist the witness in explaining his or her testimony” (Legate 2006).

As every good teacher knows, visual aids, by allowing jurors to *see* abstract concepts and relationships, significantly enhance both understanding and retention. Trial lawyers must remember that most jurors receive their primary information from television and are

conditioned to learn more from visual images than from words alone. (Babcock and Bloom 2001)

THE PROFESSION OF MEDICAL ILLUSTRATION

Medical illustrators create illustrations, animations, models and other media (collectively known as ‘visuals’) that help communicate complex biomedical and scientific issues, by presenting them in a simplified, easily comprehended format (Mader 1995, Legate 2006). They have a unique combination of specialized education and experience in medicine and visual communication. Most have Master’s degrees from one of only five medical illustration programs of study in North America – all offered within departments at medical schools. Courses of study include: human anatomy, embryology, neuroanatomy, pathology and histology (see Figure 4). Many medical illustrators are certified by the Association of Medical Illustrators – which requires formal academic training, as well as ongoing professional development to acquire and maintain certification.

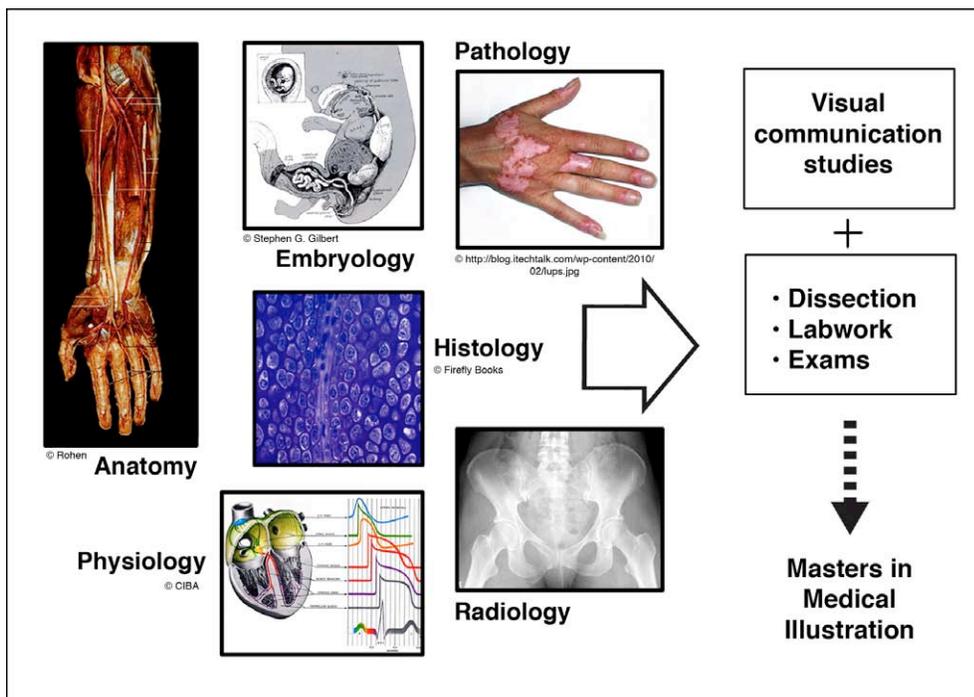


Figure 4: Some of the courses studied by medical illustrators in faculties of medicine in the few specialized programs offered in North America, leading to a Master’s in medical illustration.

Medical-legal illustrators specialize in communicating issues associated with accident and medical malpractice claims for legal proceedings. They translate radiological images (x-rays, CT

and MRI scans, etc.) into simplified visual concepts, which can be comprehended by a lay audience. Detailed surgical procedures are depicted concisely: what lies under the skin or behind other structures (i.e., showing what a camera can not); relationships between anatomical structures (e.g., injury of a nerve adjacent to a fractured bone); and underlying anatomical causes for long-term disability (e.g., joint deterioration from osteoarthritis which, in turn, resulted from cartilage damage).

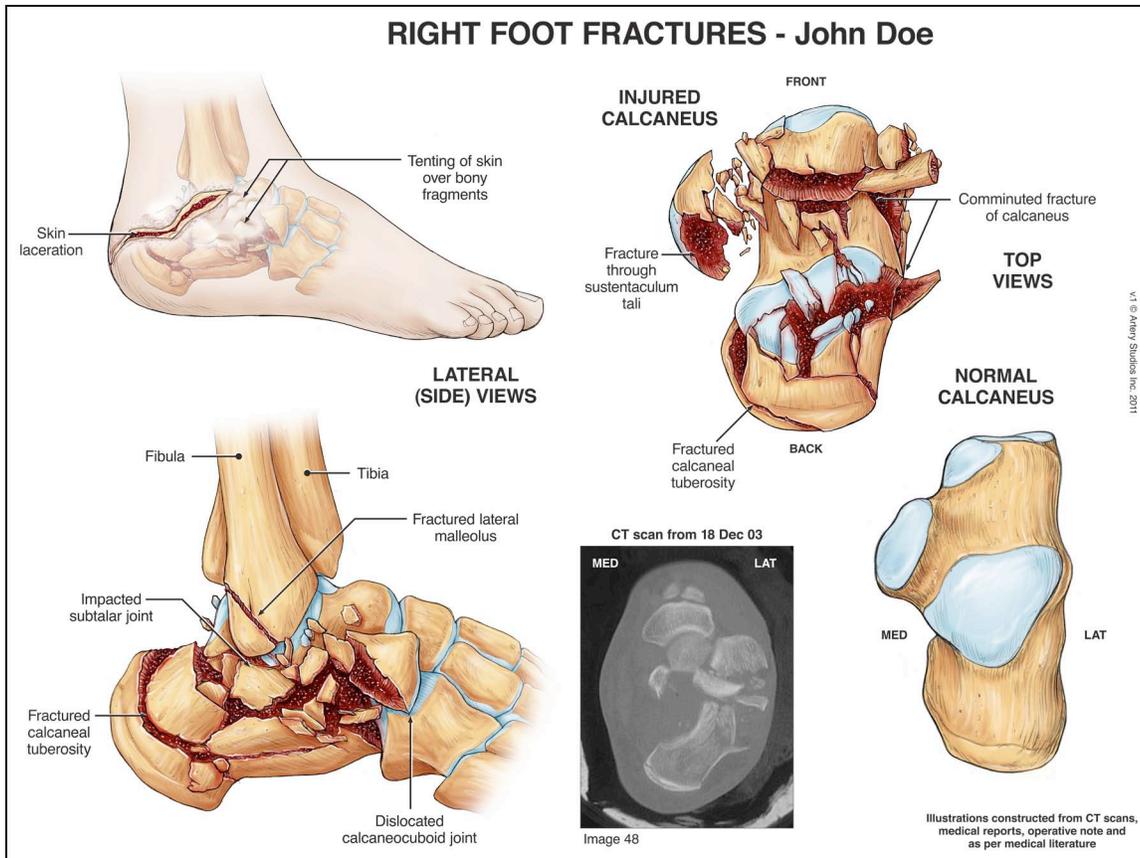


Figure 5: Example of a medical illustration exhibit, which simplifies complex medical information into a readily understood visual presentation.

These types of visuals summarize the trauma, anatomical, surgical and injury complication issues in a PI case (see Figure 5). Information presented in this way is especially persuasive - it involves the viewer and is remembered (Oatley 1998).

Research conducted by interviewing practicing personal injury litigators (Mader et al 2005) found that lawyers expressed a need for these types of visuals to: to maximize understanding; be credible and admissible; and be personalized to the case. Medical-legal visuals must be simple, focused, and serve to clarify the issues (Turbak et al 1994).

TYPES OF CUSTOMIZED MEDICAL VISUALS

RADIOLOGY EXHIBITS (ENHANCED RADIOLOGY POSITIVES)

Because x-rays, CT scans and other forms of radiology are often extremely complex, even highly trained radiologists must carefully analyze them to fully appreciate all details. Adding overlays to clarify such things as fracture details or hardware, labels from the radiologist's report, as well as colour, shading and titles, can greatly assist in communicating radiological findings to non-medically trained people (see Figure 6). While this form of demonstrative evidence allows for the presentation of some case issues, a knowledgeable medical expert may still be required to walk the viewer through the findings if the films are quite nuanced. These images may be presented as an electronic display (see Transitional Image Sliders below) or as a poster panel.

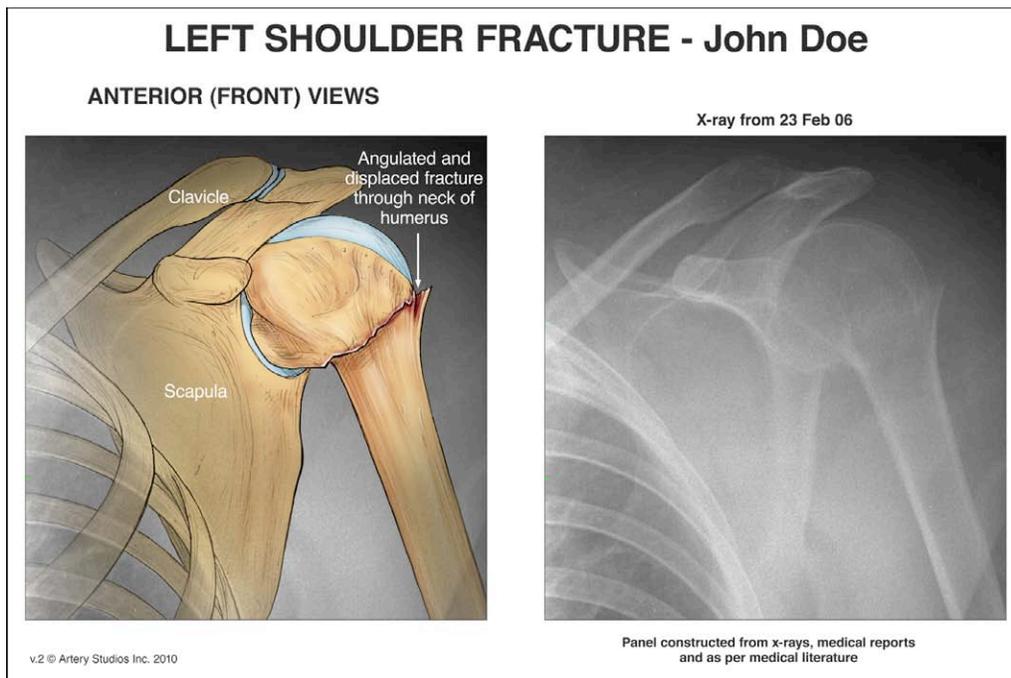


Figure 6: Example of an enhanced radiology image with the addition of colour, outlines, shading, fracture details and labels.

VIRTUAL 3D RADIOLOGICAL IMAGES

Current imaging software allows for the creation of digital models from CT and MRI data. By controlling the software parameters, specific anatomical structures may be demonstrated (e.g., bones), and others excluded (e.g., soft tissues or internal organs), in order to depict trauma issues such as fractures (see Figure 7).

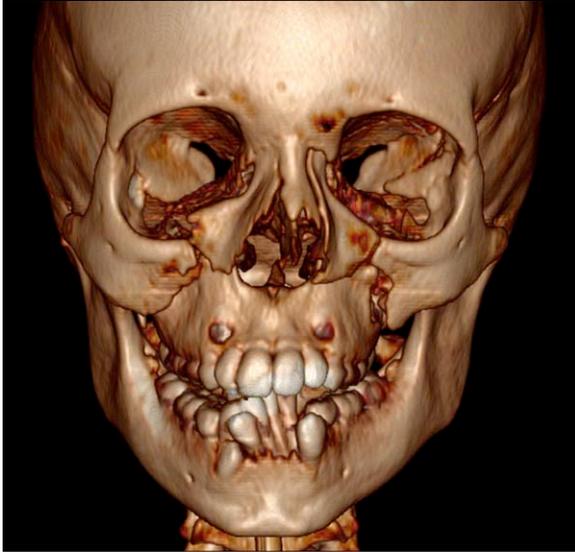


Figure 7: A virtual 3D radiological image constructed from CT data. Fractures of the facial bones are demonstrated – note fractures below the orbits and through the nasal bones.

CASE-SPECIFIC MEDICAL ILLUSTRATIONS

Medical illustrations are simplified to show only those anatomical, surgical or pathological issues that are relevant and important for understanding the critical issues of the file. The amount of information communicated in each illustration is limited so as to not overwhelm the viewer. Surgical depictions (see Figure 8) demonstrate only the main stages of the procedure.

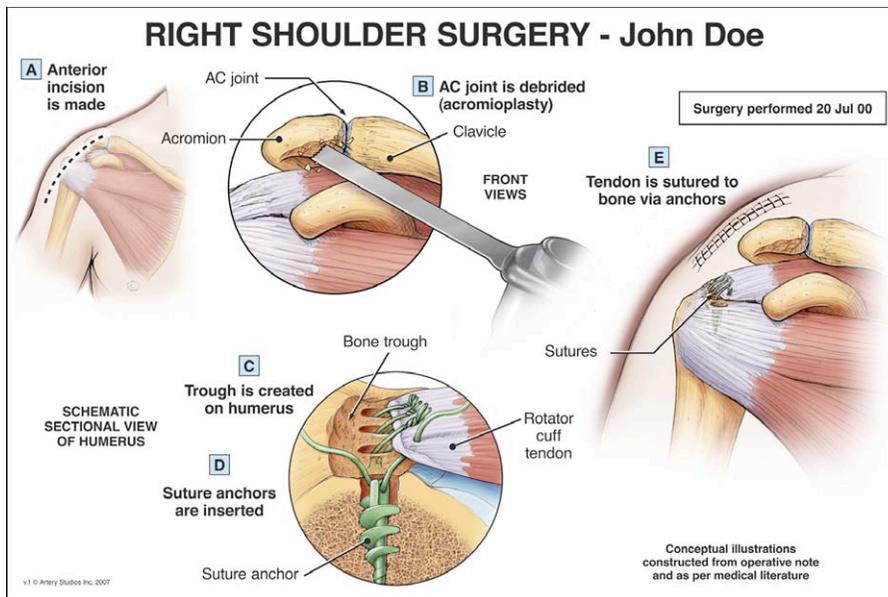


Figure 8: Depictions of lengthy surgeries are simplified to focus only on the key stages of the operation, in an easily followed format.

ANIMATIONS

Animations depict issues that are best demonstrated by showing moving elements in virtual 2D or 3D space. They are motion-based depictions of a medical expert's opinion or theory (Rogers 2004). Issues of time and motion may be presented in animation format, such as the proposed

mechanism of injury, trauma complications or mobility issues (see Figure 9). Computer animations clearly and persuasively communicate technical concepts to a non-technical audience (Oatley 1999).

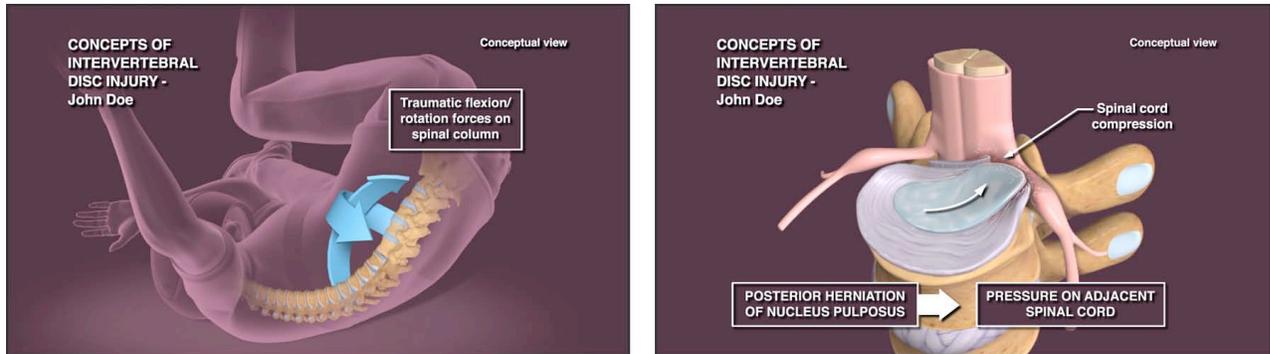


Figure 9: Still frames from an animation that depicts traumatic forces to the spine with resultant intervertebral disc injury.

STEP-BY-STEP SLIDE PRESENTATIONS

Step-by-step presentations communicate the critical stages of an event as though in time-lapse format (see Figure 10). They are typically viewed in PowerPoint™ or Flash™. The lawyer or expert can display each image for as long as required to explain it. This visual format is ideal for showing surgical issues, where details of complex procedures may need to be emphasized.

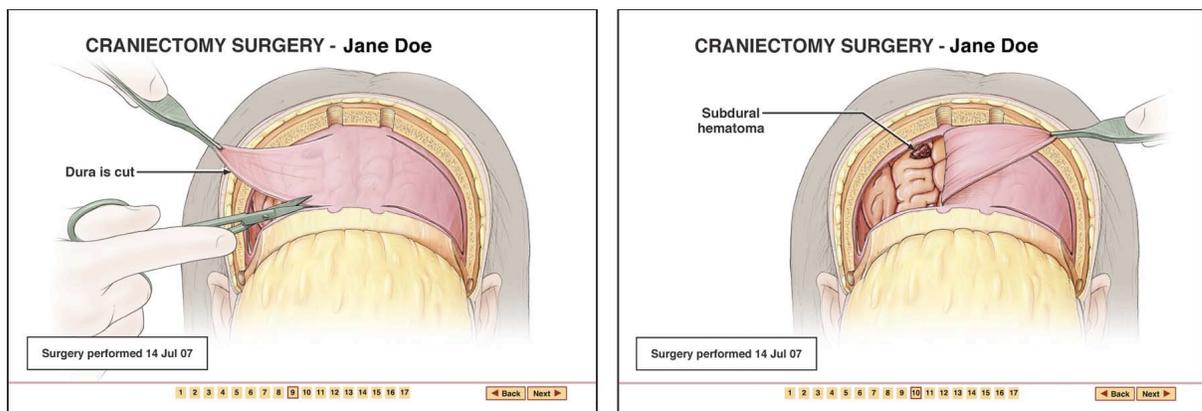


Figure 10: Frames from a step-by-step presentation. The slides in this example depict details of craniotomy surgery with opening of the dura and exposure of the subdural blood.

STORYBOARDS

Storyboards are composed of sequential drawings (see Figure 11) that represent a frame-by-frame account of what a full animation would depict (Mader 2006). This visual is analogous to a

comic strip, except that the drawings are detailed, realistic and without dialogue balloons (Bailey 1994).

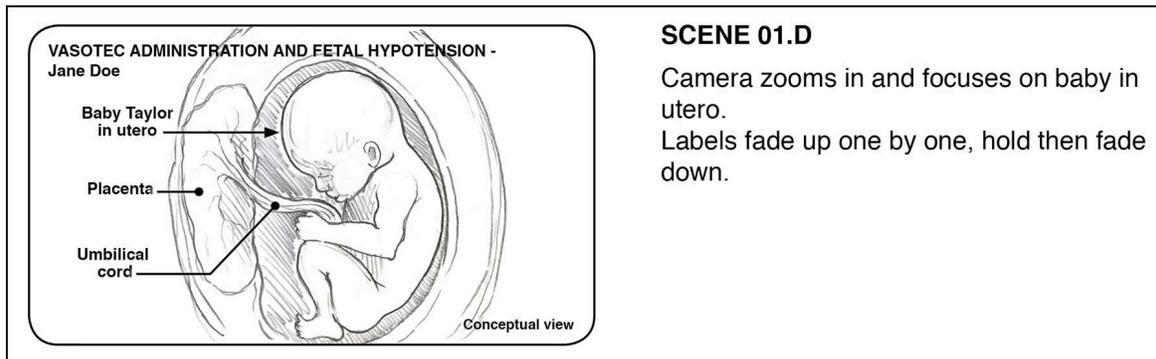


Figure 11: Example of a frame from a storyboard.

TREATMENT CHARTS

Charts showing such issues as medications, medical treatments and employment patterns can organize and display significant quantities of important and complex information spanning periods of time (see Figure 12). This format of presentation can demonstrate patterns that support case arguments.

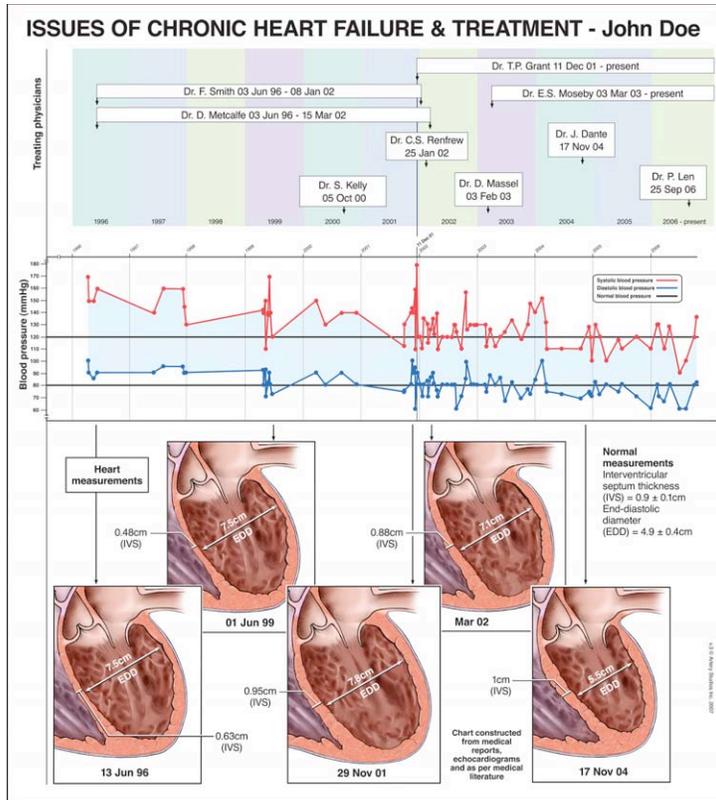


Figure 12: Example of a treatment chart, which provides a visual representation of a large volume of data (all physician names have been changed).

COMPARATOR SLIDE PRESENTATIONS

This presentation mode allows for the direct comparison of contrasting procedures or anatomical views. For example, operative errors may be contrasted against what should have been done by the surgeon (see Figure 13).

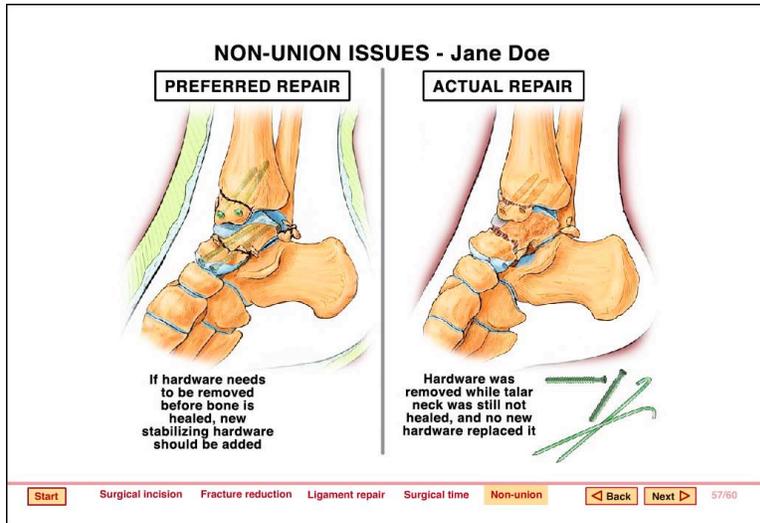


Figure 13: Frame from a comparator slide presentation. Contrasting images allow for comparison between possible options. Illustration on left shows what surgical procedure should have been performed; image on right shows what was actually done.

INTERACTIVE MEDICAL ILLUSTRATIONS

The functionality of presentation software (Flash™) can be integrated into illustrations that are interactive – including for the iPad. In an interactive illustration typically one main image provides orientation for the viewer. When specific anatomical regions are selected, a larger, detailed view grows to fill the screen (see Figure 14). This type of presentation is ideal for cases that require depictions of injuries to numerous anatomical regions.

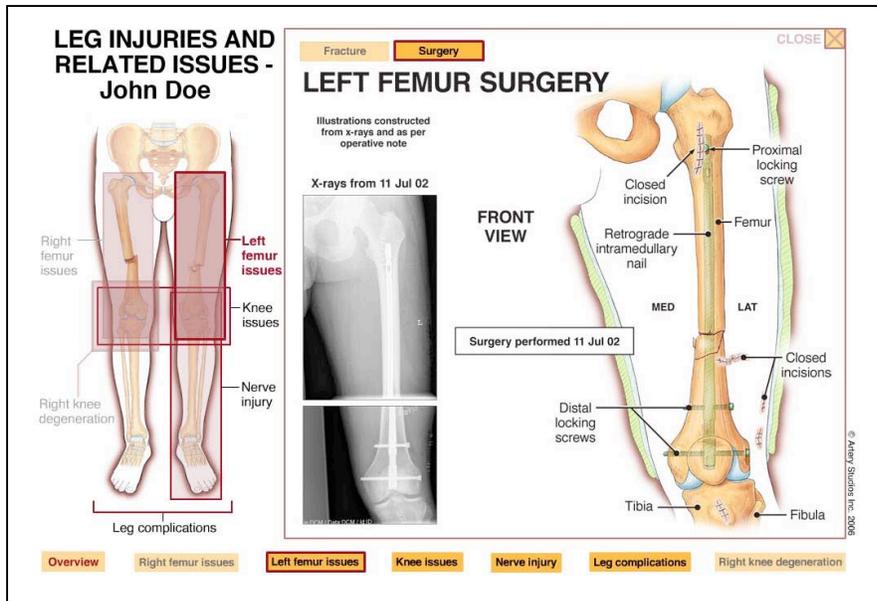


Figure 14: Frame from an interactive medical illustration. The illustration on the left provides orientation, while enlarged images, presented consecutively, demonstrate details of each injured region.

INTERACTIVE TIMELINES

Digital timelines may depict detailed information correlated with time, including notations from the hospital records or test results, and may also include radiology, medical illustrations and animations (see Figure 15). In many cases judges appreciate a timeline (Ferguson 2004).

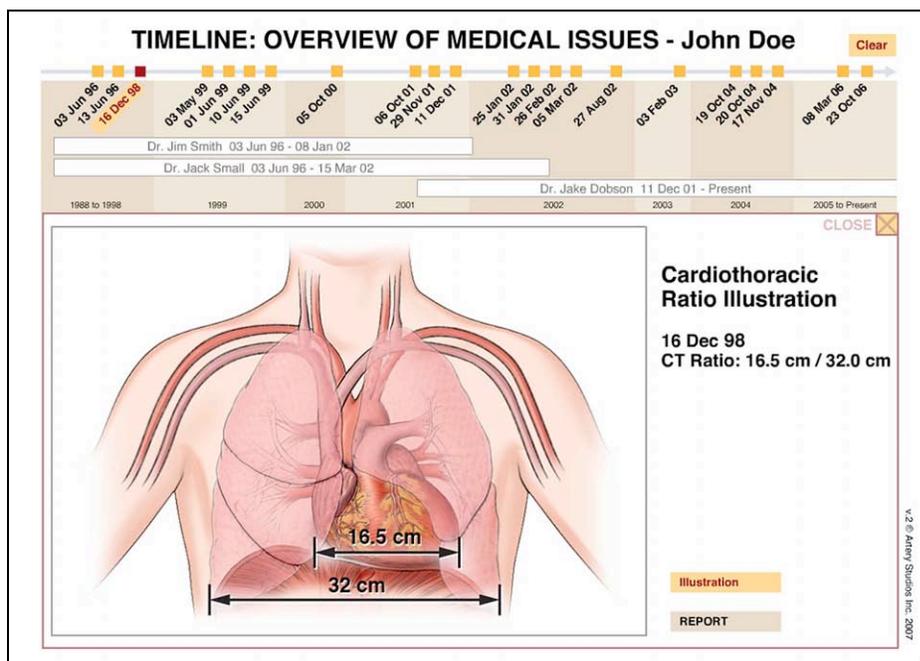


Figure 15: Frame from an interactive timeline. When a date is selected, details of the medical issue associated with that time consecutively enlarge to fill the screen.

TRANSITIONAL IMAGE SLIDERS

These presentations allow for transitioning (or ‘morphing’) between one image and another¹ (see Figure 16). This allows for depiction of such things as comparisons between ‘before’ and ‘after’ views, and radiological images with accompanying explanatory illustrations (Mader 2006).

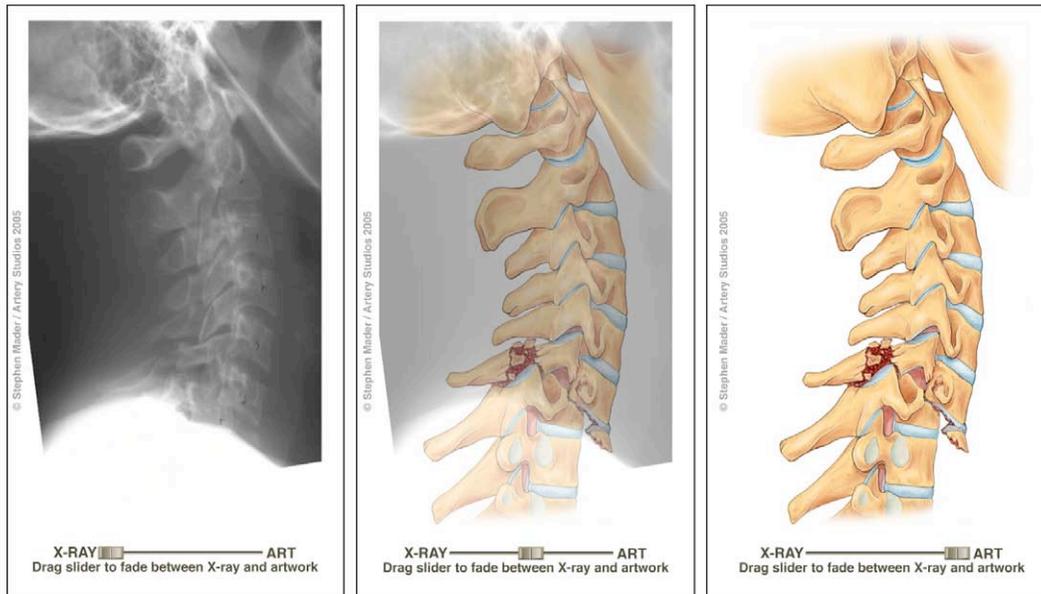


Figure 16: Stages of a transitional image slider, which morphs between an x-ray of the cervical spine and a corresponding illustration of it. Exact explanation of the film, while not losing a depiction of the original, may be obtained with this visual type.

INTERACTIVE FETAL MONITORING STRIP

In birth injury cases, the fetal heart monitoring strip or tracing, documents specific medical findings of both fetus and mother during labour, including the baseline heart rate, accelerations and decelerations to the heart rate, and uterine contractions. Interactive Fetal Monitoring Strips are created by digitally assembling the long strip into a seamless display, thereby showing several hours of monitoring in an easy-to-use format (see Figure 17). Electronic interactivity is added to assist in presenting key information in the tracing, such as the ability to scan back and forth, pause on a critical point, highlight and annotate areas and search by time stamp. Explanatory illustrations may be added to demonstrate issues such as placental abruption or other birth trauma complications.

¹ Initial research in the academic use of Flash™-based medical-legal visuals was performed at the University of Toronto (Division of Biomedical Communications), by Assistant Professors Leila Lax and Jodie Jenkinson.

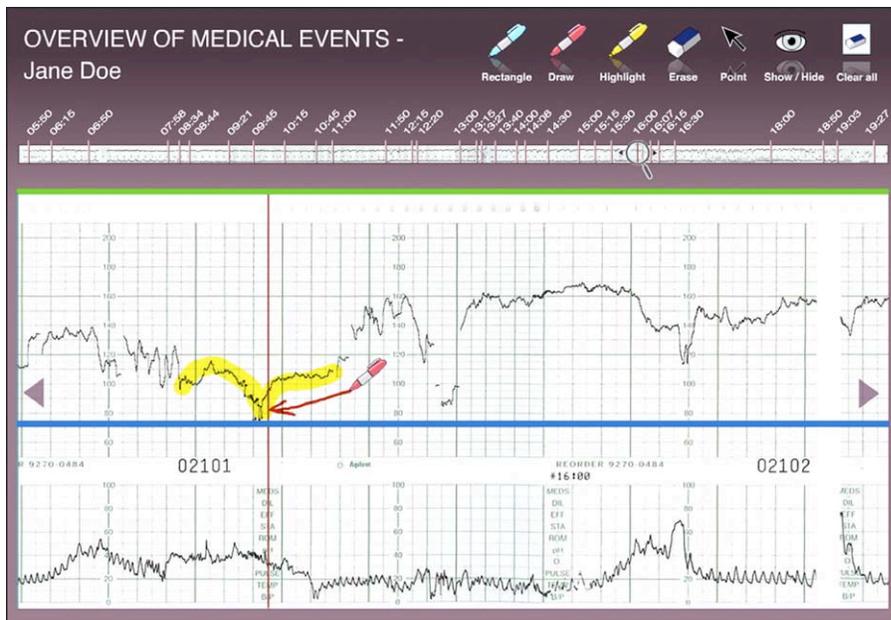


Figure 17: Screen from an Interactive Fetal Monitoring Strip showing highlighting and other interactivity options.

RAPID PROTOTYPE MEDICAL MODELS

Innovations in 3D printing allow for a radiology model to be ‘printed’ as an actual physical life-sized (or scaled) model that can be held in the hand (see Figure 18). CT and MRI data are reformatted (similar to Virtual 3D Radiological Images – see above), with details carefully adjusted to demonstrate the injury issues. Colour is added to the model to communicate fracture patterns or other pathology. Trauma, surgery, long-term degeneration and other injury issues may all be demonstrated with this type of visual.



Figure 18: Photographs of a Rapid Prototype Medical Model constructed from CT data, cast as a life-size physical model, and details hand-painted to depict pathology (fractures).

INTEGRATING VISUAL STORYTELLING

A. PRODUCTION OF CUSTOMIZED MEDICAL VISUALS

All medical documents from the legal file are reviewed, including radiology reports, operative notes, physician letters, rehabilitation notes and medical-legal expert reports. Issues that are relevant to the production of visuals are noted. From this information, a comprehensive proposal is sent to the lawyer, outlining all suggested visuals that would demonstrate the salient issues of the file, and incorporating any specific directions provided by the firm.

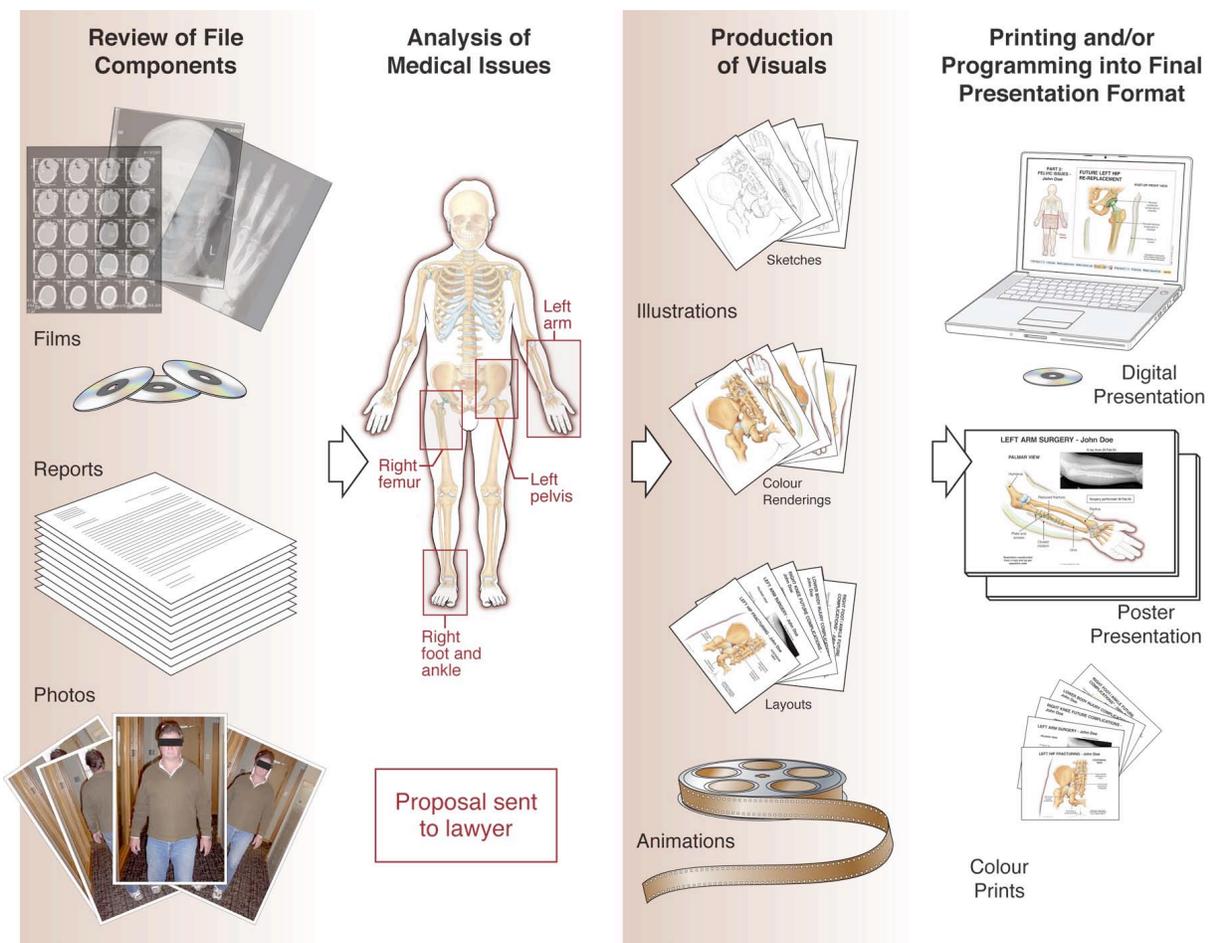


Figure 19: Summary of how medical-legal visuals are produced.

Once the proposed ideas are approved, production of visuals proceeds. X-rays are traced to capture all proportions and medical content, pencil sketches are drawn, colour images are rendered, animations and interactive medical are created (where relevant), and all graphic

elements (i.e., illustrations, labels, titles, prints of radiology, etc.) are designed into readily understood ‘panels’, movie scenes or interactive digital files (see Figure 19).

Consulting medical experts may provide input throughout the production of these images and definitely after their completion. They write a short report identifying the visuals they have reviewed and attesting to the accuracy and relevance of the visuals.

B. HOW THE MEDICAL ILLUSTRATOR ENSURES ACCURACY OF VISUALS

The careful analysis of all relevant medical reports and diagnostic images from the case, allows for the accurate creation of visuals that address all essential issues and dovetails with the legal argument and opinions of the medical experts.

Size, position and proportions of anatomical structures and associated injury pathology, surgical hardware and other details are rendered directly from the films. Written descriptions in the medical reports are used to supplement these images, such as descriptions of injured nerves and vessels. Finally, respected medical literature is used to augment additional depictions.

Extraneous or potentially inflammatory depictions, are excluded from the visuals. Although all relevant surgical, trauma and anatomical issues may be demonstrated, an experienced medical illustrator will include enough detail to provide a clear depiction while not incorporating inadmissible portrayals (Mader 2003).

PROTOCOL TO ENSURE ACCURACY OF MEDICAL VISUALS

- all reports from case are carefully reviewed, with particular focus on radiology reports, operative notes and expert opinion reports – exact findings in these reports are integrated into visuals
- search of relevant reputable medical literature is conducted to support visuals
- radiological images are carefully analyzed and sketches are created directly from the films (traced) to ensure exacting visual translation
- conceptual illustrations and other visuals dovetail with expert opinion(s) and the medical literature
- detailed illustration drafts (or storyboard outlines of animations or interactive media) are created and forwarded to lawyer and medical expert(s) for input
- final illustrations, animations and interactive media are produced and forwarded to lawyer and medical expert(s) for input
- feedback from expert(s) is incorporated into the visuals at all stages of development
- if requested, a production report outlining the process followed, the technical considerations of production, the films and medical documentation used, and the medical literature referenced, will be written by the medical illustrator
- illustrator's CV is provided, to substantiate academic credentials and experience

Figure 20: Summary of steps followed to ensure accuracy of customized visuals.

C. INTEGRATION WITH MEDICAL EXPERT OPINION

The testifying physician uses the customized visuals to explain the relevant points of the case – convincingly, in detail and with authority. Because the illustrations, animations and other media often rely upon the opinions expressed in the expert’s report, and are created ultimately for his or her use at trial, that expert must review the visuals and provide feedback to the medical illustrator well in advance of trial. Any requested changes are incorporated into the final visuals. The expert then writes a brief letter attesting to the accuracy and relevance of the images (Mader 2003). Involvement of the expert in the creation of the customized demonstrative evidence is critical for its successful use:

The use of the doctor [in] making of either a diagram or video is to *illustrate* his testimony, not substitute it for his testimony. In the end, it is his opinion [that] is the evidence upon which the trier of fact will base the decision, while the illustrative aid will have only assisted in understanding that opinion. (Legate 2006)

While on the stand, visuals may be critical to assisting the medical expert:

Consider a doctor testifying about his patient’s injury. Much testimony may be required to describe the location, extent and functional impact of a calcaneus fracture. A medical diagram will illustrate the doctor’s testimony readily. The doctor can clarify that it is merely an illustration, intended to assist the trier of fact in appreciating the testimony. If movement is impaired, a series of illustrations, or a video, can illustrate the doctor’s testimony further. It will have the advantage of ensuring that the jury understands what the doctor intends them to understand, rather than being misled and potentially conjuring up some other part of the body or mechanism of injury. (Legate 2006)

D. USING VISUALS AT MEDIATION

Although most cases settle before trial, plaintiff lawyers must treat a case as though it will end up in court (McLeish 2004). Many plaintiff lawyers wish to have visuals prepared in time for use at mediation. Use of customized images at this stage of file development demonstrates a thoroughly prepared case – one that is ready to proceed to trial if necessary – and provides a psychological edge during mediation (Mader 1995, Oliver 1994).

The types of demonstrative evidence used in the mediation setting must be carefully considered – plaintiff lawyers should focus their demonstrative aids on the main facts and use them to educate the opposing side about complex issues of the case (Wheatley 2004).

At mediation, plaintiff counsel must explain the medical concepts without the assistance of the medical experts – therefore, the use of case-specific visuals can be particularly helpful with this communication challenge. PowerPoint™ presentations may be used, with visuals incorporated into them (Mader 2003). When using visuals at mediation, plaintiff lawyers develop a very good idea of how a jury will react to the images, should the case end up proceeding to trial (Oatley and McLeish 2004), and can, in turn, communicate this to other mediation participants. At the same time, defense counsel will assess the credibility of the case, the client, and the plaintiff lawyer, in order to conclude what impression will likely be made on a judge or jury (Wheatley 2004). The use of effective visuals at mediation can have a profound impact on the attempted settlement of cases.

E. USING VISUALS AT TRIAL

Visuals may be referred to in trial opening provided it has been determined that defense will not be objecting to the use of them:

Use demonstrative evidence early and often – from the opening address to the first witness and every witness thereafter. Repetition is pivotal to persuasion. Demonstrative evidence is pivotal to persuasion. The repetitive use of demonstrative evidence will have a synergistic effect and will significantly increase your chances of success. (Vigmond 2007)

The visuals must be formally admitted as evidence through the testimony of the medical expert on the case. During testimony, he or she will support their use and assure the court that the visuals are accurate, relevant, and useful to explain the issues of the case.

Most visuals produced by medical illustrators are considered illustrative evidence, rather than substantive evidence. Much has been written on admissibility issues of demonstrative evidence (see Legate 2006, Oatley 1999, Oatley and McLeish 2004). Evidence is categorized as either substantive evidence, which has probative value, or illustrative evidence, which supports other substantive evidence (Legate 2006).

If the evidence is merely illustrative of otherwise proven substantive evidence, the test for admissibility should be more relaxed. For such evidence, providing the evidence is not unfair

or misleading, and providing it is relevant and helpful to the trier of fact, it should be admissible if it accurately illustrates otherwise admissible substantive evidence. (Oatley 1999)

The intention of customized demonstrative evidence is to assist in appreciating, recalling and understanding the issues and evidence in action – the intention is not to mislead (Legate 2006).

OUTCOMES OF USING VISUALS IN LITIGATION PROCEEDINGS

Lawyers report that integrating customized visuals adds impact to their arguments and that their use contributes to faster resolution of files with fairer awards for their clients. “The use of demonstrative evidence is critical in a presentation of evidence in respect to damages – both pecuniary and non-pecuniary” (Vigmond 2007). Most experienced medical experts are well accustomed to using illustrations – indeed, many expect to use them, to help communicate to a jury:

Their technical and often boring but important testimony is lost on the juror who cannot follow or is uninterested in following the evidence of the expert. While the trial judge is allowed in our system of justice to take copious notes, the jury is expected to sit and only listen. Without some sort of aid to assist in the comprehension of technical evidence, the juror is at risk of making wrong decisions. It is for that reason many experts have been allowed by modern judiciary to use visual aids to demonstrate and illustrate their testimony. (Legate 2006)

Visuals can further assist in the testimony of medical experts by helping control the presentation of their evidence, by guiding and assisting them, and by focusing the jury’s attention on their critical evidence being presented (Cooper 1999). Further, the images may stimulate feelings and affect the listener emotionally, thereby enhancing a persuasive argument or the testimony of an expert (Babcock and Bloom 2001).

Judges report they may have difficulty understanding oral testimony, and appreciate the use of visual presentations; expert witnesses may need to explain complex issues, which are better communicated with visual images (Ferguson 2004).

Finally, reliable demonstrative evidence can shorten the litigation process. It can focus expert testimony, help dispel non-issues, and shorten the length of time required for experts to be on the stand (Legate 2006).

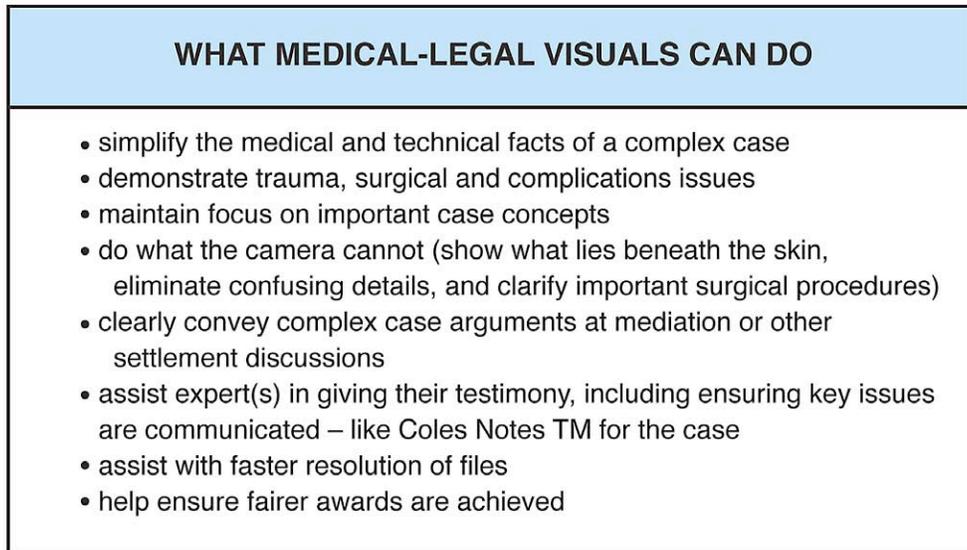


Figure 21: Summary of the effects of a visual approach to communicating cases.

CONCLUSION: ENHANCING PERSUASION

Customized, case-specific medical illustrations, animations, models and interactive media are critical to the effective communication of medical issues and can play a significant role in complex case litigation (see Figure 21). They demonstrate a thoroughly developed file and add impact to the evidence presented. They are essential to fostering understanding of important medical issues and have become the accepted norm in many jurisdictions.

We have come so far, that more than one lawyer has expressed the view that the failure to use demonstrative evidence in any complicated case approaches negligence. (Legate 2006)

A visual approach to communicating complex cases, makes arguments memorable, demonstrates confidence in knowing the medicine, assists in development of the entire legal team, and facilitates medical expert testimony. Customized visuals are of great benefit in the art of persuasion.

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With thanks to Elina Mer and the other staff members at Artery Studios Inc.

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