Designed by Practitioners for Practitioners

PRMS Bulletin: Issue #1

Welcome to the very first issue of the PRMS Bulletin. I hope you will find the information contained here interesting, informative and hopefully at times funny.

The Bulletin is presented in 3 general sections.

1. Hints & Tips which users of PRMS may find useful.
2. News section, which will contain information about updates or answers to specific questions from users.
3. Articles, usually as introductory paragraphs with links to full versions of the article, but also full articles. I will aim to write a full article myself for each of the issues.

There are no specific intervals for publication. Sometimes I may publish 2 bulletins one or two weeks apart, other times it may be two or three months between issues.

This bulletin is not intended to be promotional information for PRMS, although it will contain information specific to it, but rather it is a publication for healthcare professionals across a diverse range of disciplines. Hopefully you will find it interesting and informative.

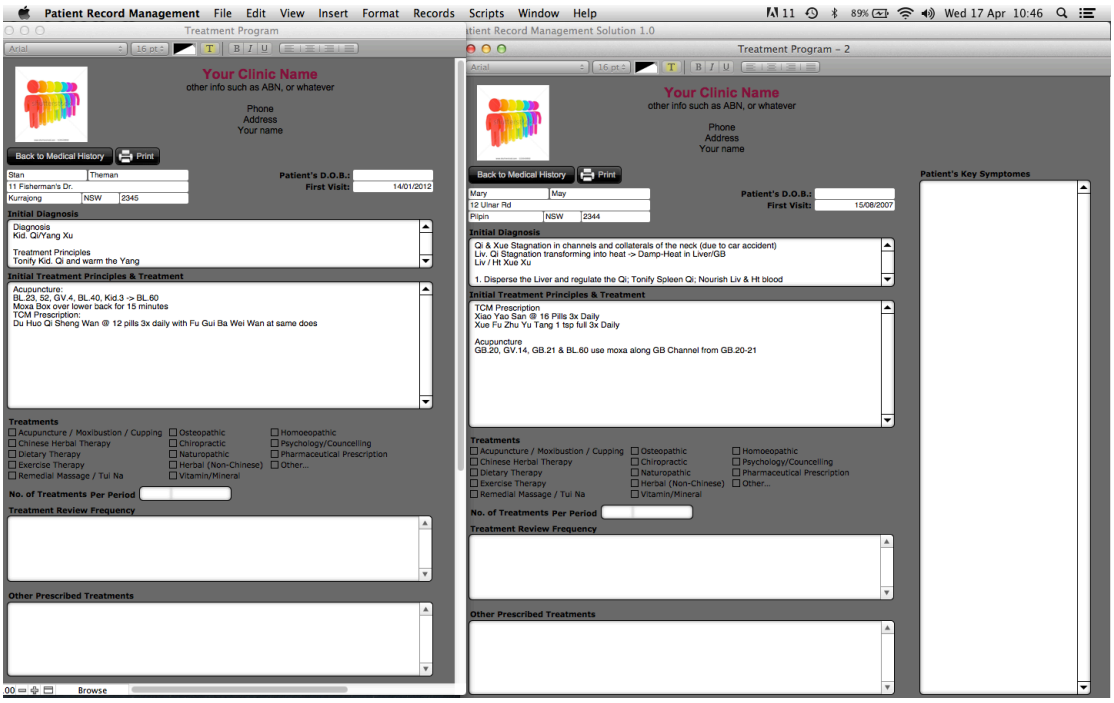
You are invited to contribute with questions or information you would like to see shared and I will endeavour to include such information whenever possible and applicable.

Thank you all for joining our PRMS Bulletin

HINTS & TIPS

PRMS contains a lot of 'hidden' treasures. In this issue we will look at how you can have multiple case histories, receipts, treatment programs, etc., open at the same time.

This is really very simple and you have probably already discovered this. However, if you haven't, open your copy of the program or the trial version and take a look at the top of your screen on the Menu bar, there you will see ***Window*** the first line after clicking on ***Window*** says ***New Window***. Simply select this and you will find a duplicate window will open to the one you have already open. Usually the software will place it over the top of the previous one, so you will need to move it to the side. As with any window you can resize it so that the two windows can fit next to each other and you can look at the information on window each side by side.



It doesn't matter whether the initial window you where looking at is a Receipt, Case history, Prescription or any other window. The New Window will be a duplicate of it. Once the second window is open, you simply perform a find command in the ***new window*** to locate the information you would like to see in order for you to compare and contrast the two sets of information... easy.

NEWS

The price has gone up to $745 (plus GST, Postage & Handling), however this is still much cheaper than other options available where on going fees and charges never end. However, we realise that it's not always easy to just put your hand in your pocket and spend a significant amount of money in one hit. It is now possible that you may be able to have an easy payment method organised for you. If you wish to purchase PRMS v1.0 and need finance, give us a call, we might be able to help you.

Answers to questions:

Can PRMS be run on iPad?

Yes it can. In fact you can also run it on your iPhone – I wouldn't recommend this, but it does work even on an iPhone.

It does not however run on Android Tablets or Android Smartphones to the best of my knowledge. Even on Apple's iPhone and iPad it is not 100% functional. You can do all the basic stuff, such as entering data, but Automatic Back ups don't work with FileMaker Go (the app you need to install and run PRMS v1.0 on you iPhone/iPad) because it does not support Plug-ins. You will need to back it up to a computer and restore your iPad from your backed up files if your iPad happens to fail.

I have loaded it onto both my iPhone and iPad, but really, it has not been designed as an app. Rather it is a piece of software designed to be used with a laptop or desktop computer in a clinic situation or for the purpose of home visits.

Does it integrate with MYOB or other Accounting Software?

The answer is both Yes and No. That is it does not directly integrate with MYOB or other accounting software. However, you can export information such as summaries for a month or year to XL. From XL you should then be able to import it into any other software that can import XL files.

You might want to have a look at the Tutorial Video entitled: "How To Create Monthly Summaries" under "Video Tutorials and Support" tab on our home page: www.PatientRecordManagementSolution.com.au

It takes you through the simple steps of summarising a month of receipts and then export them to XL.

ARTICLES

Evidence-Based Medicine and Naturopathy

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Abstract

Evidence-based medicine (EBM) has been advocated as a new paradigm in orthodox medicine and as a methodology for natural medicines, which are often accused of lacking an adequate scientific basis. This paper presents the voices of tradition-sensitive naturopathic practitioners in response to what they perceive as an ideologic assault by EBM advocates on the validity and integrity of natural medicine practice. Those natural medicine practices, which have tradition-based paradigms articulating vitalistic and holistic principles, may have significant problems in relating to the idea of EBM as developed in biomedical contexts. The paper questions the appropriateness of imposing a methodology that appears to minimize or bypass the philosophic and methodological foundations of natural medicine, and that itself seems primarily driven by political considerations. (View whole article here)

Guidelines of minimum patient record keeping requirements

The following article is actually a direct copy of the Chinese Medicine Board of Australia's Guidelines for TCM Practitioners and Acupuncturists. The reason I've included this in this Bulletin is because there is now much talk in the healthcare industry of other therapies also looking at registration – it's just a matter of time.

For this reason ANTA recently held a meeting where Patient Record Keeping was the main topic of discussion and I think it should sound warning bells for many practitioners.

You may not know this, but when TCM Practitioners had to apply for registration, some were required to submit case histories as proof of practice and as proof of adequate history taking and correct implementation of treatment. Patient records had

to be de-identified (difficult to do on paper records) and submitted to the board. Some applicants (applying under the grandparenting provision) had to submit 100 such records...

As I'm a TCM Practitioner I thought you maybe interested in getting a viewpoint from someone that had to go through this process. I've added my comments and opinions in italics.

Guidelines for Patient Records, as published by Chinese Medicine Board, 27 July 2012

Please note: Italicized text is written by Danny Siegenthaler and only reflects his opinion and interpretation.

Introduction

These guidelines have been developed by the Chinese Medicine Board of Australia (CMBA) under section 39 of the *Health Practitioner Regulation National Law Act* as in force in each state and territory (the National Law).

Who needs to use these guidelines?

These guidelines are developed to provide guidance to registered Chinese medicine practitioners or those seeking to become registered in the Chinese medicine profession as to the minimum standards for clinical record-keeping for Chinese medicine practitioners. They apply to all Chinese medicine practitioners and students and any personnel working under supervision in the practice of Chinese medicine. These guidelines will be used in an investigation or other proceedings related to registered Chinese medicine practitioners as evidence of what constitutes appropriate professional conduct or practice.

> *Danny's comment: While at present these guidelines are specifically for practitioners that wish to be registered as TCM Practitioners or Acupuncturists, these guidelines are expected to be followed by all healthcare professionals. So, even though this document was constructed specifically for Chinese Medicine/Acupuncture practitioners, it really does, or soon will, apply to all healthcare professionals. In other words, if you see patients as a practitioner of a modality such as herbal medicine, remedial massage, naturopathy, hoemeopathy, etc., you are expected to record your patient's history in the following, very detailed manner.*

Summary

Chinese medicine practitioners must create and maintain clinical records that serve the best interests of patients and that contribute to the safety and continuity of their Chinese medicine care. To facilitate safe and effective care, patient records must be accurate, legible and understandable and contain sufficient detail so that another practitioner could take over the care of the patient if necessary. These guidelines describe the **minimum requirements for clinical records** whether they are in paper or electronic form. Where laws exist related to the keeping of patient case records, practitioners must comply with those laws. If there is any inconsistency between this guideline and the provisions of any Act or Regulation, the provisions of the Act or Regulation prevail.

Note: For the purpose of these guidelines, the term *patient* is used to refer to the person receiving the treatment and care. In other contexts, the terms *client* or *consumer* may be used.

Clinical records for Chinese medicine practitioners

1. Responsibilities

Chinese medicine practitioners have a professional and legal responsibility to:

- keep as confidential the information they collect and record about patients
- retain, transfer, dispose of, correct and provide access to clinical records in accordance with the requirements of the laws of the relevant states, territories and the Commonwealth

  Danny's comment: Ok, think about this. You have to keep these records for at least 7-10 years (see next point below), possibly longer if the patient was a young child when you saw them first. Now, you've accumulated hundreds if not thousands of patient files in boxes or whatever you keep these records in. Now someone wants a copy of their history, say 5 years or more after you last saw them... Easy if your records are in a searchable electronic format, but not so easy if they aren't.
- practitioners must be familiar with the requirements of the *Privacy Act 1988* (Cth) as well as their state or territory privacy and health records legislation, including the provisions that govern the retention of health records (which usually require retention from seven to 10 years) and the retention of records relating to children and youth under 18 years of age.

Danny's comment: in other words, if you are seeing a patient 5 years of age, my understanding is that you must (a) keep the record for 7-10 years after they turn 18. That means potentially having to keep a record for 20 years or more in storage somewhere...

• third party access is subject to the provisions of the relevant privacy and health records legislation

• assist patients to make well-informed decisions about treatment procedures and not impose treatment on patients

Danny's comment: if you are in a habit, and you should be, of outlining a treatment program to your patient, in which you discuss with them the plan for their treatment, the possible duration and other factors that encompass their treatment, you shouldn't have any problems with this one. You are now required to give them a copy of such a treatment plan so they know what has been discussed and agreed on.

2. General principles to be applied

- Each patient should have an individual health record containing all the health information held by the practice about that patient.
- A Chinese medicine clinical record must be made at the time of the consultation or as soon thereafter as practicable or as soon as information (such as results) becomes available and must be an accurate and complete reflection of the consultation. If the date the record is made differs from the date of the consultation, the date the record is made must be recorded and the date of the consultation noted. The time of consultation is to be recorded where there is more than one consultation or treatment on the same day.
- Entries on a clinical record must be made in chronological order.
- Chinese medicine clinical records must be legible and understandable and of such a quality that another Chinese medicine practitioner or member of the health care team could read and understand the terminology and abbreviations used and, from the information provided, be equipped to manage the care of the patient. The use of generally accepted abbreviations in patient case records is satisfactory, but the use of obscure codes and abbreviations should be avoided.
- If documents are scanned to the record, such as external reports, the scanning needs to be undertaken in a way that reproduces the legibility of the original document.

- Chinese medicine clinical records must be able to be retrieved promptly when required.
- Chinese medicine clinical records must be stored securely and safeguarded against unauthorised access and loss or damage.

  Danny's comment: this sounds simple, but is not necessarily so. Most of us have or still do store records in filing cabinets under lock and key. Fine, but that's not all that secure and if there's a fire and the office burns down, there my not be any records left, unless it was in a fire-proof cabinet – do you have one of those? I don't.

  So the only way to comply with this, as I see it, is to have it on a computer, that contains password protection (this covers the stored securely and safeguarded against unauthorised access bit), and the patient files are backed up onto an external device that can be stored elsewhere (covering you for loss or damage). That way, at least you have two copies, one on the computer the other on an external device. In this way you've covered your self against almost anything that could happen to your patient records.

  But apart from the legal stuff – you would have lost all your records and as I see it, this would be a catastrophe for your business and for the continuation of your patients' care.
- All comments in the clinical record should be respectful of the patient and be couched in objective, unemotional language.
- Chinese medicine practitioners should be familiar with the requirements in the Board's *Code of conduct for registered health practitioners*, *Section 3.16: Closing a practice*. The Code requires the transfer or appropriate management of all patient records in accordance with the legislation governing health records in the state or territory in which the person is treated.
- Corrections can be made to a clinical record provided the correction is signed by the practitioner and the original entry is still visible.
- A treating Chinese medicine practitioner cannot delegate responsibility for the accuracy of information in the Chinese medicine clinical record to another person.

3. Information to be held with the patient record

The following information forms part of the clinical record and is to be recorded and maintained, where relevant:

- identifying details of the patient, including name, contact details, gender and date of

birth (and patient's parent or guardian where applicable) in English

- current health history and relevant past health history, including known allergies and alerts to adverse drug reactions
- relevant family health-related history
- relevant social history including cultural background where clinically relevant
- contact details of the person the patient wishes to be contacted in an emergency (not necessarily the next of kin); Note: This information needs to be kept up to date and also be kept in English
- clinical details - for each consultation, clear documentation of information relevant to that consultation including the following:
    - the date of the consultation
    - the name of the practitioner who conducted the consultation, including a signature where applicable
    - the presenting condition
    - relevant history
    - information about the type of examinations conducted
    - relevant clinical findings and observations
    - other treatments/therapies being used (including herbal, pharmaceutical, manipulative, dietary, psychological, etc.)
    - Chinese medicine diagnosis, treatment principle(s), recommended treatment plan
    - all procedures conducted including details of all acupuncture points and stimulation method
    - any medicine prescribed, administered or supplied for the patient or any other therapeutic agent used (including name, strength, quantity, dose, instructions for use, number of repeats and details of when started or stopped); if supplied, the details recorded must comply with the standards of the profession
    - details of advice provided
    - recommended management plan and, where appropriate, expected process of review;
    - other relevant information (e.g. a discussion about possible side effects or alternative forms of treatment)
    - details of how the patient was monitored and the outcome (progress notes)

- any unusual sequelae of treatment or adverse events.
- relevant diagnostic data, including accompanying reports
- instructions to and communications with external health service providers;
- all (relevant) diagnostic laboratory, imaging and other investigations data and reports
- other details:
    - all referrals made or recommended and any letters and reports from other practitioners
    - letters received from hospitals and other clinical correspondence
    - all relevant communication (written or verbal) with or about the patient, including telephone or electronic communications
    - details of anyone contributing to the Chinese medicine care and record and
    - estimates or quotations of fees.

Danny's comment: Do yourself a favour and go through a couple of your patient files and see if you've covered each and every point above. If not, think about wether or not the information would have been deemed 'Relevant'...

Progress Notes The level of detail required in a patient case record may vary according to the nature of the presenting condition and whether it is an initial or subsequent consultation. For example, in the case of subsequent visits for an ongoing condition, information recorded in earlier consultations need not be repeated, unless there are relevant changes. Progress details and treatment must, however, be recorded clearly.

Records not in English

It is the Board's preference that records be kept in English. Given the primary purpose of the record to create a comprehensive and accurate record, the Board accepts, however, that in some circumstances it may be preferable to use a different language. This will only apply to practitioners registered per grandparenting provisions. This will also be an important professional judgment made by the practitioner and the Board notes that if a practitioner has submitted evidence or a statement that they meet the CMBA English Language Standard, there is an expectation that their patient records will be in English.

Where records are maintained in a language other than English, should a copy of a patient's records be requested by the patient, or required by the CMBA or an authorised third party, it is the responsibility of the Chinese medicine practitioner to provide at their own expense an English translation of the patient's records or cover the cost of this service.
This position will be revised in 3 years.

Information critical to patient safety

Information critical to patient safety, such as herbal names should be recorded in the most competent language e.g. English, Chinese, Latin, other.

4. Requests for reports or records

Chinese medicine practitioners have a professional and legal responsibility to:

- Provide a report of the patient's treatment and progress to another health practitioner where requested by the patient.
- Upon request by the patient, provide access to and or copies of records relevant to the patient. A reasonable fee reflecting the time and costs associated with this request may be charged to the patient.

5. Accounting records

Chinese medicine practitioners have a professional and legal responsibility to maintain accurate, legible contemporaneous accounting records of each visit.
(i) As a minimum, each accounting record must be labelled with the patient/clients identifying details and:

- the date of each service;
- itemised fees charged; and
- details of all payments including the date of the payment.

(ii) An itemised receipt must be issued for each payment, indicating the date of payment, name of the practitioner who provided the service, address where the service was provided with contact telephone number, name of the patient who received the treatment, date of service, all treatment(s) provided and all product(s) supplied with charge(s).

6. Electronic records

Electronically held records must meet the same requirements as non-electronically held records with the following additional considerations:

Records should be password protected to ensure that only the practitioner and authorised support staff can access the records. Protective pass-codes should be used and updated on a regular basis including when a staff member ceases employment.

Patient records should not be sent by email unless there is protection, such as encryption, from potential unauthorised access. No individual should be permitted to access or use the practice computer(s) other than the Chinese medicine practitioner and authorised staff members. Patient access to their records held on computer can be provided via a direct print-out of the record.

Adequate backup systems to protect patient records are essential and must provide a guarantee of the ability to restore up-to-date information in the event of power loss or system or computer failure.

> *Danny's comment: at the risk of sounding like I'm promoting my PRMS software, it is a very handy and valuable tool, in terms of backing up and safeguarding patient records. Not only does the software remind you hourly to back up to a flash drive or other external device, but in my case I also back up the files at the end of every day onto a solid-state external hard-drive. In other words, the files are on my laptop (password protected), the flash drive and my external hard drive.*
>
> *You see my partner and I have moved several times over the past 20 years and at least on one occasion some of our patient files that were stored in cardboard boxes never arrived at their destination. So, we've become slightly paranoid about securing records and now with registration, it's become vital to do so.*

7. Confidentiality

Chinese medicine practitioners have a legal and ethical responsibility to keep patient information confidential. Obligations are set out in a number of State and Commonwealth laws.

The principles enshrined in these laws should inform Chinese medicine practitioners' record keeping in terms of: collection, use, disclosure, disposal and transfer of information, as well as in relation to the quality and security of the information and the mechanisms by which access to information is given. Chinese medicine

practitioners must inform themselves regarding relevant laws and standards and ensure compliance.

Chinese medicine practitioners have the responsibility to ensure that all staff members with access to patient records are properly instructed in maintaining patient record confidentiality. The legislative requirements apply to all individuals who handle patient information.

> *Danny's comment: This is a good one, because of the '...legal and ethical responsibility to keep patient information confidential...' part. As I've pointed out elsewhere, this is why any electronic record keeping software should NOT be cloud or internet-based. I think, it is impossible for anyone to say that such a system complies with this requirement, considering the amount of internet fraud and unauthorized access into systems such as Apple's iCloud, Bank accounts, etc. Just my opinion, but I would not be surprised if internet-based systems will come under severe scrutiny before too long.*

References

1. *Australian Acupuncture and Chinese Medicine Association Ltd*, Code of Conduct, May 2006
2. *Chinese Medicine Registration Board of Victoria,* Guidelines on patient records, May 2010
3. *Privacy and health records legislation:* Useful information regarding privacy and health records legislation can be found at www.privacy.gov.au. Third party access is subject to the provisions of the relevant privacy and health records legislation.

I thought I'd include the next article, because even if you are not into Acupuncture, the recent developments regarding connective tissue and facia is one of the more interesting 'new' areas of study.

The Science of Stretch [*An explanation of how Acupuncture works*]

The study of connective tissue is shedding light on pain and providing new explanations for alternative medicine.

By Helene M. Langevin | May 1, 2013

Helene M. Langevin is a visiting professor of medicine and Director of the Osher Center for Integrative Medicine at Brigham and Women's Hospital, Harvard Medical School, and a professor of neurological sciences at the University of Vermont.

It joins your thigh to your calf; your hand to your arm; your breastbone to your clavicle. As you move, it allows your muscles to glide past one another. It acts like a net suspending your organs and a high-tech adhesive holding your cells in place while relaying messages between them. Connective tissue is one of the most integral components of the human machine. Indeed, one could draw a line between any two points of the body via a path of connective tissue. This network is so extensive and ubiquitous that if we were to lose every organ, muscle, bone, nerve, and blood vessel in our bodies, we would still maintain the same shape: our "connective-tissue body." Despite increasing evidence of its role in chronic pain and other diseases, connective tissue is not very well studied. I arrived at researching connective tissue by a circuitous route. Working as a clinical endocrinologist, I would see patients suffering from chronic pain, and quickly became frustrated with the treatment options I could offer—usually some combination of physical therapy and analgesics, which often were not very effective. Some of my patients would ask about trying acupuncture. But, having done research in neuroscience and being firmly rooted in the practice of Western medicine, I was sceptical. Eventually, I decided to learn more, if only to be able to respond to patient questions more intelligently.

In 1986, I took evening classes at the Tri-State Institute of Traditional Chinese Acupuncture in Stamford, Connecticut (now the Tri-State College of Acupuncture in New York City), which offers hands-on experience in acupuncture. The teacher described how to twirl the inserted acupuncture needles just enough to elicit a particular sensation in the patient, usually described as an ache in the area surrounding the needle, which can radiate some distance away from it. I was told that the acupuncturist is supposed to feel tightness or tugging on the needle, akin to when a fish gets caught on a hook. When I felt that tug myself, I became curious about the physical mechanism that was causing it. The teachers explained it as muscle contracting around the needle, but I could feel it in locations, such as the wrist, where there was no muscle at all. The needles had to be interacting with connective tissue. A decade later, after I had moved to the then Department of Neurology at the University of Vermont (UVM) College of Medicine in Burlington, I had the

opportunity to begin research on the acupuncture “needle grasp.” Here was a physiological phenomenon that one could feel with one’s fingers, but which had no obvious biological explanation. I started collaborating with Martin Krag, an orthopaedic surgeon at UVM who had some experience testing alternative-medicine approaches using scientific methods. The logical first step was to quantify the tugging response to acupuncture needling. With the help of David Churchill, a biomedical engineer in the Orthopaedic Department at UVM who designed a robotic acupuncture-needling instrument, we began measuring the force needed to pull out the needles in a reproducible manner from 16 different points on the body. We measured the “pullout force” in 60 human subjects and found that it did indeed increase after needle rotation, at times so dramatically that it exceeded the capacity of our 500 g load-measurement device.[1]

We then tested the possible mechanisms that could cause this phenomenon, starting with simple experiments in which we inserted and rotated a needle in a piece of rat abdominal wall. What we saw under the microscope was quite striking: when acupuncture needles were rotated, the loose connective tissue under the skin became mechanically attached to the needle. Even a small amount of rotation caused the connective tissue to wrap around the needle, like spaghetti winding around a fork.[2] This winding caused the surrounding connective tissue to become stretched as it was pulled by the needle’s motion. Using ultrasound, we confirmed that the same phenomenon occurs in live tissue.[3]

In the years that followed, I became part of a small but growing community of scientists who were joining the ranks of molecular and physiological researchers dedicated to studying this neglected tissue. Connective tissue has been relegated to the role of passive viscoelastic material in traditional biomechanical models, but researchers are now beginning to demonstrate just how many systems of the body may be affected by mechanical changes in connective tissue, and some of these findings are beginning to inform clinical practice.

A growing field

Connective tissue is something of an orphan child in medicine: although it is an integral part of the musculoskeletal system, connective tissue is basically absent from orthopaedic textbooks, which deal principally with bones, cartilage, and muscles.

Orthopaedic interest is almost exclusively restricted to the "specialized" connective tissues such as tendons and ligaments, which connect bone to muscles and to other bones, respectively. Nonspecialized connective tissues, which form what's known as the fasciae and envelop all muscles, nerves, bones, and blood vessels, are typically allotted a short paragraph in current textbooks, if mentioned at all.

However, interest in the field has been growing. One area that has attracted many researchers at the cellular level is the study of mechanotransduction: how the integrin family of adhesion molecules forms a physical and informational link between the extracellular matrix and the interior of cells. Through these cell-matrix connections, cells sense forces and transform these mechanical signals into cellular responses such as the activation or deactivation of signalling molecules, translocation of transcription factors into the nucleus, and ultimately, changes in gene expression.[4] In addition, substantial evidence supports the notion that mechanical signals can be transmitted directly through the cytoskeleton into the interior of the nucleus. (See "Full Speed Ahead," *The Scientist*, December 2009.)

Some of the most well-established work in this field has involved the study of fibroblasts—the cells that are responsible for synthesizing all the proteins that make up the extracellular matrix. These cells reside within the matrix they create, responding to mechanical stimulation by regulating the amount of collagen and other matrix proteins produced, and by secreting matrix-degrading enzymes in response to chronic changes in tissue forces. Such changes can be induced by repetitive motion and are thought to be an important factor in work-related musculoskeletal injuries such as tendinitis of the shoulder or wrist.[5]

Here was a physiological phenomenon that one could feel with one's fingers, but which had no obvious biological explanation.

Fibroblasts also play a major role in the response to acute injury, particularly when they transform into myofibroblasts. Before the availability of surgery and surgical sutures, gaping wounds needed a powerful mechanism in order to pull shut and heal. Myofibroblasts serve this function by secreting large amounts of collagen and expressing α-smooth muscle actin protein, which make the cells contractile.[6] Then, by exerting tension on the collagen matrix, these cells pull the edges of the wound

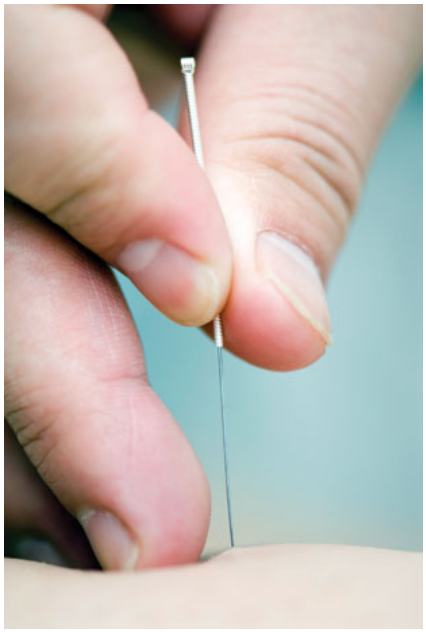
together. Myofibroblasts normally die once this job is done and a stable scar has formed. However, during chronic inflammation, myofibroblasts can drive an excessive deposition of collagen, and the increased tissue tension can result in the development of tissue contractures that restrict full range of motion. This response is also thought to play a role in the development of some types of tissue fibroses and cancer. Indeed, fibrotic, or scarred tissues, become stiffer, and cancer cells have been shown to spread more easily on fibrotic matrices.[7]

WHEN CONNECTIVE TISSUE STRETCHES

Although much of the work in this area to date has been performed in cell culture, rather than in whole tissue, some of this basic research is beginning to inform clinical research and practice, especially in the area of chronic musculoskeletal pain, including low-back pain. One of the reasons that low-back pain is so difficult to manage is that large numbers of patients have no detectable abnormalities of the spine and associated tissues, and the source of their pain is unknown. Some groups have begun to investigate the possibility that the pain is arising from the nonspecialized connective tissues on either side of the spine.

Indeed, researchers at the University of Heidelberg found in 2008 that connective tissues contain sensory nerve endings that can transmit pain when these tissues are stretched in the presence of inflammation.[8] Until then, it had not been clear whether connective tissue had its own sensory nerve supply capable of generating sensations. Subsequently, ultrasound studies in my laboratory demonstrated that the connective tissues that surround the muscles of the back are, on average, thicker in people with chronic low back pain.[9] Normally, these connective tissues are composed of alternating layers of tightly woven dense fibers that can bear substantial loads, and loose areolar tissue, which contains large quantities of water and allows the adjacent dense layers to glide past one another. In addition to having thicker connective tissue overall, people with low-back pain show a decreased gliding motion of dense layers, suggesting that a fibrotic process could cause the decreased mobility.

Connecting the dots



TISSUE TENTING: A twisted acupuncture needle creates a localized stretch by gripping the underlying connective tissue. This effect can be observed as a “tenting” of the skin as the needle is pulled out. Despite these recent advances, the overwhelming majority of research on connective tissue still involves cells grown in culture dishes. And recent studies suggest that, especially for fibroblasts, the mechanical behavior of cells may be quite different when cells are grown on 2-D surfaces compared to cell behavior in a 3-D environment that is more similar to that of whole tissue, such as a thick collagen gel. For example, it is becoming apparent that the ubiquitous intracellular “stress fibers” characteristic of fibroblasts grown on 2-D surfaces are not present in fibroblasts grown in 3-D-culture environments or in whole tissue, and that these fibers may in fact be an artifact of cell culture, rather than a phenomenon that has physiological meaning. The fact that the study of fibroblasts in whole tissue is lagging far behind that of fibroblasts in vitro, combined with the general lack of attention to nonspecialized connective tissue at the whole-body level, has limited the understanding of natural connective-tissue function.

I began my research into connective tissue on the whole-animal level, but quickly began to investigate the cellular components involved in the winding response to acupuncture needles. After dissecting some of the tissue we had manipulated, we saw that the fibroblasts residing in the connective tissue as far as several centimeters away from the needle began to reorganize their internal cytoskeleton and change shape, becoming large and flat. We also found that the same reorganization response could be elicited by simply stretching a piece of connective tissue between two grips and holding the tissue in the stretched position for about 30 minutes, or even stretching an anesthetized mouse by bending its body to one side.[10] Interestingly, 30 minutes is typically the amount of time that needles are left in place during an acupuncture treatment. Furthermore, if one lets go of the needle after rotating it, the needle does not unwind right away. Thus, the “whorl” of connective tissue remains intact as long as the needle remains under the skin, causing the tissue to be stretched for a prolonged period.

Ongoing studies in my lab are addressing why the fibroblasts change shape in response to sustained stretching. So far we have found that the changes are associated with a large-scale relaxation of the connective tissue. We also saw that the fibroblasts initiated a specific Rho-dependent cytoskeletal reorganization that was required for the tissue to fully relax. Rho is an intracellular signaling molecule known to play a role in cell motility and the remodeling of cell-surface proteins that connect the fibroblast to its surrounding matrix. The molecule's involvement in fibroblast shape change suggested that the cells are able to reduce the tissue tension by adjusting how strongly and where they are gripping the surrounding connective tissue or muscle. (See illustration above.) In addition, we found that the shape change is also associated with a sustained release of ATP from the fibroblast.[11] Within the cell, ATP acts as fuel, but outside of the membrane, ATP can function as a signaling molecule. Extracellular ATP can be converted to other purines such as adenosine, which can act as a local analgesic, thus providing a possible cellular and physiological mechanism to explain the pain relief experienced by some acupuncture patients.[12] (See "Puncturing the Myth," *The Scientist*, September 2011.)

Acupuncture-needle manipulation results in sustained stretching, and therefore constitutes a useful tool that can be used to study this biomechanical function.
The possibility that connective tissue dynamically regulates its level of tension is intriguing, as it could dampen fluctuations in tissue tension. Connective tissue surrounds nerves, blood vessels, and lymphatics, and reducing changes in tissue tension could affect how these structures function. Importantly, fibroblast cytoskeletal reorganization is a rather slow process, taking several minutes, and therefore would occur in response to sustained changes in tissue length such as changes in posture and body positions. Remarkably little is known about the effects of static tissue stretching, though repetitive, cyclical stretching has been extensively studied because of its relevance to breathing, walking, and cardiovascular pulsations. Acupuncture-needle manipulation results in sustained stretching, and therefore constitutes a useful tool that can be used to study this biomechanical function.

In contrast to the general neglect of connective tissue in the conventional medical and scientific fields, "alternative-medicine" researchers, and especially clinical practitioners, have for many years recognized the potential importance of connective

tissue in health and disease. In conventional physical therapy, stretching of surgical scars and joint tissue that has contracted and stiffened after prolonged immobilization is widely believed to cause remodeling of connective tissue. Alternative therapies such as myofascial release and Rolfing focus on stretching as a treatment modality for musculoskeletal pain, even in the absence of an obvious past injury or scarring. Indeed, a variety of alternative manual and movement-based therapies work under the collective assumption that connective-tissue pathology lies at the source of musculoskeletal pain, and that this can be ameliorated with manual treatments.

Connection to acupuncture meridians

The mysterious "acupuncture meridians," defined as lines or tracks connecting acupuncture points, also may be related to connective tissue, as they seem to be preferentially located along connective-tissue planes between muscles, or between muscle and bone. We have found that more than 80 percent of acupuncture points in the arm are located along connective-tissue planes.[13] This makes sense, since loose connective tissue houses blood vessels and nerves, suggesting that mechanical stimulation of connective tissue generated by needle manipulation could transmit a mechanical signal to sensory nerves, as well as intrinsic sensory afferents directly innervating connective tissue.

Clearly, connective tissue needs more attention. A simple PubMed search illustrates this problem, as specific subject headings for "nonspecialized connective tissue" do not exist. By default, alternative medicine has become a motivating force in connective-tissue research and clinical practice. This is an example of an area in which the combination of conventional and alternative medicine, typically referred to as "integrative medicine," should be understood in a broader sense as integration within medicine itself, inspired by alternative-medicine concepts. The growth and maturation of the field of connective-tissue research will no doubt benefit from exciting new developments resulting from this integration.

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This issue of our Bulletin turned out a little longer than first anticipated. I hope however that you found the information contained here useful and informative.

If you have any constructive feedback I would love to hear from you.

Please feel free to contact me if you have any question, or would like more information about any of the content of this Bulletin.

In good health

Danny Siegenthaler & the PRMS Team