Summer 2014

Newsline

HPS Pharmacies

St Andrew's partners with HPS

to Deliver State-of-the-art Cancer Treatment Facility

Plus:

HPS Expands Services in Tasmania with Calvary,
Safety Issues of Fentanyl Patches, and Drug Dosing in Obesity

HPS Pharmacies

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Cover Image
St Andrew's Medical Centre, delivering state-of-the-art cancer treatment in Adelaide, South Australia.

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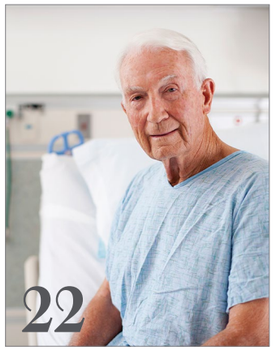

Message from Tony Wyatt CEO

HPS Pharmacies opened the New Year with two new sites flourishing since inception in late 2013. It is a positive extension to HPS' continued journey, supporting the business' charter for growth and our delivery of high quality pharmacy services.

Oncology has been a focus for HPS and it was with great delight our long-time partner, St Andrew's Hospital, expanded their services to open a new state-of-the-art Medical Centre on South Terrace in Adelaide, specialising in oncology services. Supporting and contributing to the new facility has been a significant accomplishment for HPS Pharmacies, as the business looks to further develop its presence within the oncology market. To facilitate the delivery of customised services to the new Medical Centre, HPS – Adelaide (South Terrace) was purposefully built to ensure services were tailored to the direct needs of St Andrew's Hospital and its patients.

Equally significant is HPS' expansion with established partner Calvary via the delivery of a new on-site pharmacy at Calvary Health Care Tasmania – St Vincent's Campus in Launceston. The new on-site pharmacy is an innovative offering for HPS Pharmacies as it delivers services to both Calvary – St Vincent's Campus and St Luke's Campus. HPS continues to nurture its strong relationship with Calvary and it is a privilege to add further value to the existing partnership.

Additionally, HPS Pharmacies' commitment to delivering high quality services has been demonstrated at HPS – Modbury in Adelaide's North-East, through its collaboration with SA Pharmacy to implement pharmaceutical reforms at Modbury Hospital. Following the successful roll-out of the PBS reforms at HPS – Whyalla, HPS – Modbury has embraced the reforms to ensure equitable access to medications for patients of Modbury Hospital. The reforms are complemented by a significant investment by Modbury Hospital to deliver a newly refurbished on-site presence for HPS Pharmacies.

The year ahead looks promising with further expansion on the horizon as the business implements strategies to continue our growth journey and reinforce our national presence as leading pharmacy service provider.

Tony Wyatt
Partner/Chief Executive Officer

Message from Steve Yeo COO

HPS Pharmacies' expansion and performance at the close of 2013 was remarkable, providing a strong platform from which to commence the New Year. It is exciting to welcome 2014 with a renewed focus following a demanding, yet rewarding, year of exponential growth and diversity.

Continuing this momentum, HPS Pharmacies' Executive Team recently convened to discuss the business' solid performance and endorse its strategic plan for the upcoming twelve months and beyond. The year ahead is filled with exciting opportunities and the Executive Team look forward to implementing these key strategies to ensure the business performs to its fullest potential.

Operationally, HPS Pharmacies 2013 Client Surveys have assisted to further refine operations and ensure HPS continually evolves with its client's dynamic needs to deliver the highest level of service. Client surveys are a vital tool to provide HPS with valuable feedback and insights on the needs of our clients, and on behalf of HPS Pharmacies, I would like to sincerely thank all clients who participated.

In mid-February, HPS Pharmacies' valued product suppliers were invited to attend HPS' highly successful procurement event, the Orderbook Summit. This innovative biannual forum brings HPS Pharmacies and its business partners together to further enhance and develop its mutually beneficial partnerships. The summit is an integral event on the HPS Pharmacies calendar and has a profound affect in garnering supplier support for future business endeavours.To that end, HPS Pharmacies operates within a challenging business environment, yet our unwavering commitment to delivering the highest quality services establishes new paths for growth and continues to expand our national footprint. I look forward to sharing HPS Pharmacies' ongoing success with our valued clients as we continue our charter for growth, further strengthening HPS' position as Australia's leading provider of pharmacy services.

Steve Yeo
Chief Operating Officer

St Andrew's partners with HPS to deliver state-of-the-art cancer treatment facility

HPS Pharmacies is excited to have its long-standing partnership with St Andrew's Hospital expanded with a new development in oncology care in South Australia.

St Andrew's Hospital has recently opened a new Medical Centre opposite Adelaide's south parklands that includes a purpose built state of the art chemotherapy suite. This new centre, together with the cancer inpatient facility and surgical radiotherapy, mark St Andrew's as the overall complete provider of private oncology services in Adelaide.

It was a monumental step forward for HPS Pharmacies in the successful tender of a new on-site pharmacy at the state-of-the-art St Andrew's cancer centre. Nestled on the out-skirts of the Adelaide CBD, the customised cancer facility provides HPS Pharmacies with a central location to implement pharmacy services and further strengthens HPS Pharmacies' oncology presence in South Australia.

HPS Pharmacies' Partner and General Manager of Hospitals, Tin Huyhn, is excited by HPS' extension into the new cancer centre and the opportunity to further grow the relationship between HPS Pharmacies and St Andrew's Hospital.

"HPS Pharmacies has provided dedicated oncology pharmacy services to long-time partner St Andrew's Hospital for a number of years. The transition of the day oncology unit to the exceptional new St Andrew's Medical Centre provided HPS Pharmacies with the opportunity to further expand our services by establishing a state-of-the-art oncology pharmacy with a sterile suite. The contemporary pharmacy will deliver a superior and responsive service via on-site chemotherapy compounding capabilities. Any adjustments in dose or regime required by the client can be catered for in a timely manner, ensuring there is no delay in patient treatments. St Andrew's Medical Centre is a unique site and HPS Pharmacies are elated to be a part of this project. We look forward to delivering an enhanced service to staff and patients of St Andrew's Hospital".

In conjunction with the 19 chair day chemotherapy suite at St Andrew's Medical Centre, HPS Pharmacies' on-site pharmacy is purposefully built with an oncology focus providing a space for the preparation of critical chemotherapy, reducing overall waiting times for patients from the time of prescribing.

HPS – Adelaide (South Terrace) Pharmacy Manager, Paula Kwan, sees the opportunity for a more informed and structured approach to oncology care with the on-site pharmacy able to place pharmacists on the front-line interacting one-on-one with patients.

"Prior to our presence on-site, chemotherapy was prepared off-site and pharmacists did not have a complete history of their treatment. With the new site, a HPS Pharmacies pharmacist will have increased involvement with a patient's treatment and therefore be able to offer more in terms of professional services and advice".

> *"By working closely with the HPS Pharmacies team, our patients experience the best service available…"*
>
> – Stephen Walker, Chief Executive Officer, St Andrew's Hospital, South Australia

The pharmacy design complements St Andrew's Medical Centre's network of specialty services, with a private counselling room offering patients undergoing treatment private and personalised counselling with a pharmacist to better understand their medication and receive recommendations for supportive therapies. The on-site pharmacy is also characterised by its retail capabilities, offering the local community greater accessibility to general pharmacy needs.

HPS Pharmacies have a wealth of experience in the private hospital industry and can offer improvements in response time, flexibility and accuracy to St Andrew's cancer centre.

St Andrew's Hospital Chief Executive Officer, Stephen Walker, is excited for the expansion of HPS Pharmacies and St Andrew's working partnership via the new cancer centre, and is confident the on-site pharmacy can contribute to a more proactive medication monitoring system.

"St Andrew's has an excellent relationship with HPS Pharmacies and the staff are considered an integral part of the St Andrew's team. Our partnership via the new Medical Centre will ensure our chemotherapy patients are provided a comprehensive high quality service.

"By working closely with the HPS Pharmacies team, our patients experience the best service available. One-on-one counselling with pharmacists will ensure our patients walk away with a complete understanding of their treatment. The opportunity to make our patient's experience more positive is invaluable to St Andrew's Hospital".

HPS Pharmacies are thrilled to be supporting St Andrew's Hospital in this new venture and look forward to enhancing the quality of service available to patients and the local community of Adelaide.

This page: Paula Kwan, Pharmacy Manager at HPS Pharmacies, with Stephen Walker, Chief Executive Officer at St Andrew's Hospital, and Tin Huynh, Partner/General Manager – Hospitals at HPS Pharmacies.

Cover page: St Andrew's Medical Centre delivering state-of-the-art cancer treatment in Adelaide, South Australia.

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HPS Expands Services in Tasmania with Calvary

> *HPS delivers a broad network of services… enabling them to draw upon their experiences and share with us their knowledge on local services and quality of patient care…*
>
> – Grant Musgrave, Chief Executive Officer, Calvary Health Care Tasmania, Launceston

Further to HPS Pharmacies' Spring 2013 edition of Newsline announcing the opening of a new on-site pharmacy at Calvary Central Districts in Adelaide's North, it is with great elation that HPS has further expanded and strengthened its partnership with Calvary through the delivery of a new on-site pharmacy at Calvary Health Care Tasmania's St Vincent's Campus in Launceston.

A unique addition to HPS Pharmacies' community, HPS – Launceston services two hospitals; Calvary – St Vincent's Campus and St Luke's Campus. The on-site pharmacy is situated at St Vincent's Campus.

HPS has a long-standing relationship with Calvary nationally, and is delighted for the opportunity to add further value to the existing partnership through the delivery of a localised and personalised on-site pharmacy solution in Launceston

Grant Musgrave, Chief Executive Officer, Calvary Health Care Tasmania, Launceston, commends HPS Pharmacies on their commitment to maintaining the strong relationship with Calvary throughout the project.

"Nationally Calvary has built a strong relationship with HPS. Despite the recent transition into Launceston bringing many challenges, HPS has managed to identify and overcome these hurdles resulting in the establishment of an on-site pharmacy service at the St Vincent's Campus. We look forward to the many benefits this will bring to our patients, doctors and staff".

Choi-Ling Batten, Pharmacy Manager at HPS Pharmacies, was instrumental in further developing the partnership and sees the new pharmacy site as an occasion for HPS Pharmacies to demonstrate its specialised knowledge of private health care.

"We are setting a new precedent for Calvary Health Care Tasmania, Launceston, with the promise of better service than they have ever seen. We have thrown everything into making this relationship as effective and successful as possible by placing priority on our ability to respond swiftly to the needs and requests of all Calvary staff and patients".

Alan Tuxford, HPS Pharmacies' Regional Operations Manager – VIC/TAS, is confident HPS has demonstrated exceptional service skills to both campuses.

"We have strived to achieve a strong working relationship with Calvary Health Care Tasmania, Launceston, and establish great lines of communication. We have demonstrated HPS Pharmacies' commitment to the delivery of quality services via our rapid and efficient responsiveness that has been tailored to their needs. It has been a great credit to all those involved to see HPS integrate into the Calvary Health Care Tasmania family".

HPS Pharmacies has over 35 years of pharmacy services experience within the private sector. As the pharmacy service provider to Calvary, HPS can leverage its national experience and apply that knowledge to operations at St Vincent's and St Luke's campuses. Grant Musgrave looks forward to sharing and drawing upon the vast experience of HPS Pharmacies.

"HPS delivers a broad network of services to private hospitals nationally, enabling them to draw upon their experiences and share with us their knowledge on local services and quality of patient care.

"Our expectation is that HPS Pharmacies will provide an excellent service to our patients, doctors, staff and local communities. Also, clinical standards will be maintained and improved upon both from a qualitative and quantitative measure. We look forward to seeing the benefits of HPS' proprietary system, ClinPod®, once implemented".

Director of Clinical Services, Calvary Health Care Tasmania Launceston, Suezanne Horder, says HPS Pharmacies' history with Calvary sites across Australia is a significant strength.

"The on-site pharmacy service has been an exceptionally positive gain for Calvary Health Care Tasmania, Launceston, with instant access to medications and information. HPS' industry experience will ensure appropriate and timely medication dispensing, imprest management, advice to patients and clinical staff, access to clinical knowledge and education opportunities. We look forward to working with the HPS – Launceston team to continue to refine and grow pharmacy support to Calvary".

HPS – Launceston is a milestone for the ever-expanding relationship between HPS Pharmacies and Calvary and demonstrates the success that can be achieved through a shared vision.

This page: Choi-Ling Batten, Pharmacy Manager at HPS Pharmacies, with Grant Musgrave, Chief Executive Officer at Calvary Health Care Tasmania, Launceston, and Alan Tuxford, Regional Operations Manager – VIC/TAS at HPS Pharmacies.

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This page: Modbury Hospital, located on Smart Road at Modbury, South Australia.

Modbury Hospital and HPS collaborate to implement PBS reforms

HPS Pharmacies is excited to collaborate with SA Pharmacy to introduce significant pharmaceutical reforms aimed at delivering patients with easier access to medications and pharmacist advice.

In 2009 the State and Commonwealth Governments introduced pharmaceutical reforms benefitting many of Adelaide's metropolitan hospitals, by restoring an equity between public and private hospitals, improving communication between the hospital, patients and primary healthcare professionals and promoting a smooth transition between the hospital and a patient's community care.

The reforms are in conjunction with the Pharmaceutical Benefits Scheme, under the Australian Government's broader National Medicines Policy. The reforms were introduced in Australia in 1948 to provide free medications to pensioners and a list of 139 life-saving and disease preventing medications, free of charge to the community.

Sixty-six years later, the PBS offers affordable, dependable and timely accessibility to essential medicines for Australians ensuring optimal health outcomes and economic objectives are achieved.

HPS Pharmacies have been ardent supporters of the PBS reforms with HPS – Whyalla previously undergoing changes as part of the reform roll-out with Country Health SA. Following this successful implementation of the reforms at HPS – Whyalla, SA Pharmacy commissioned a roll-out to HPS – Modbury in line with other hospitals within the public sector. The commission has afforded a dramatic expansion of pharmacy services at Modbury Hospital via an increased team, altered workflows, new clinical services and the relocation of the on-site pharmacy to a new, refurbished location.

HPS – Modbury Site Manager, Rania Najjar, was appointed Project Lead for the implementation of the reforms, and has worked tirelessly alongside SA Pharmacy to ensure the refurbished site satisfies the requirements of the pharmaceutical reforms.

"The refurbished on-site pharmacy has increased staff size and improved workflow to provide a more streamlined and efficient pharmacy service. The site can now offer Modbury Hospital an enhanced, comprehensive clinical pharmacy service covering specialties such as general medicine, rehabilitation, surgery, palliative care, critical care, psychiatry, geriatrics, emergency and the acute medical unit".

By participating in the PBS reforms, HPS – Modbury are ensuring equity of access to medication for patients, regardless of their place of care, and increased safety and quality of medication management, alleviating budget constraints and cost of pharmaceuticals at Modbury Hospital.

HPS Pharmacies' Partner and Regional Operations Manager – SA/WA/NT, Dominic Coppola, commends the team at HPS – Modbury for their unwavering commitment and dedication to ensuring the on-site pharmacy meets all necessary requirements of the PBS reforms, whilst continuing to provide Modbury Hospital with a full pharmacy service.

"For close to 20 years, HPS Pharmacies has conserved a dedicated relationship with Modbury Hospital and it is with great enthusiasm that the business builds on this partnership, by assisting the hospital through this time of PBS reforms. The proactive collaboration between HPS Pharmacies and Modbury Hospital promises great success for the reforms and we look forward to delivering patients with expanded services and capabilities", says Dominic.

Executive Director SA Pharmacy and Chief Pharmacist, Steve Morris, says the long-standing partnership with SA Pharmacy across a number of areas in South Australia is an important strength in the delivery of PBS reforms to Modbury Hospital.

"HPS Pharmacies has a long-standing relationship in the delivery of pharmacy services to Modbury Hospital and this will have significant impact for patients and clinical staff as the PBS reforms roll-out. The reforms bring Modbury Hospital in line with all other metropolitan public hospitals; ensuring clinicians working across the Northern Adelaide Local Health Network will have consistent access to clinical pharmacist resources".

HPS Pharmacies anticipate the reforms to be equally successful to that of HPS – Whyalla, and look forward to the promising future the reforms offer in the delivery of high quality pharmacy services alongside partner SA Pharmacy.

> *"HPS Pharmacies has a long-standing relationship in the delivery of pharmacy services to Modbury Hospital..."*
>
> – Steve Morris, Executive Director and Chief Pharmacist, SA Pharmacy

From The Team

Janene Garde

Partner/Clinical Publicist

The HPS Pharmacies Knowledge Centre is a comprehensive online resource delivering healthcare professionals a frequently updated, easy to navigate, and accessible wealth of knowledge. Launched in 2012 to deliver an expansive base of clinical and pharmacy related articles, HPS Pharmacies' 150 pharmacists have collaboratively developed the HPS Knowledge Centre into a valuable industry resource.

The articles are as diverse as their authors, reflecting varied areas of expertise; from high altitude medicine, oncology, accreditation, and research, to HPS Pharmacies' valuable client focused programs. Involvement provides HPS' pharmacists with the opportunity to share their knowledge, as well as contribute towards their continuing professional development.

In addition to preparing articles for HPS' Knowledge Centre, pharmacists can publish their work in Newsline, Drugline, DrugAlert, and HPS' client focused Lecture Series; achieving in excess of 150 pieces during 2013. Access to HPS' articles via the HPS Pharmacies website has captured the interest of medical practitioners, nurses, veterinarians and other pharmacists, who increasingly approach HPS for knowledge and advice, further strengthening the support services delivered to our clients.

I am excited by the continued success and remarkable opportunities HPS Pharmacies' Knowledge Centre presents to the business as HPS remains the industry knowledge leaders. To experience HPS Pharmacies' online library, visit ***http://www.hpspharmacies.com.au***

Megan Farnsworth

Partner/Regional Operations Manager – QLD/NSW

It was my great pleasure to partake in the opening of a new on-site pharmacy at Sydney Southwest Private Hospital in New South Wales last year. The purpose-built site provides sterile compounding capabilities that supports and delivers specialised services to the Sydney Southwest community. The continued success of the on-site pharmacy is a credit to Pharmacy Manager, Anjana Rao, who led the team to achieve significant growth and performance in the months following its opening.

In addition to the high quality pharmacy services we deliver to our clients, HPS has worked collaboratively with Tasman Oncology Research since 2011 to provide cancer patients with access to new medications via clinical trials at Pacific Private Day Hospital and Allamanda Private Hospital in Queensland. HPS – Pacific Private recently participated in a randomised and controlled trial in collaboration with Tasman Oncology Research, working closely with oncology staff at the facility to deliver the world's first Phase II dose of a novel medication for metastatic colorectal cancer. HPS is proud to have extensive experience in a range of clinical trials and thanks HPS – Pacific Private Pharmacist In-Charge, Grant Partridge, and his team, for our ongoing successful partnership with Tasman Oncology Research.

HPS has experienced significant growth on the East Coast over the past twelve months and I look forward to continuing to work closely with our teams to further enhance the high quality services delivered to our clients in line with HPS Pharmacies' position as leading pharmacy service provider.

Jason Cattonar

Chief Financial Officer

The Finance team has continued to evolve over the last twelve months as our focus remains on delivering high quality services.

As part of this evolution, Tim Cookes has ascended to the newly defined role of Finance Manager, overseeing the operations of the Finance team and providing daily financial support to the business. Additionally, we have introduced Kate McLean to fill the Assistant Accountant role, responsible for month end and statutory reporting. These changes bring a renewed balance to the team and we look forward to continuing to deliver high level services to the business.

With the 2013 financial statements now completed and approved by the Board and Partners, it is pleasing to note a significant improvement in 2013 compared to 2012. Much of the operational changes and focus over the previous 12 months gained traction, demonstrated in the 2013 results.

The first half of this financial year has been a very strong start with revenue tracking well up on prior years. This has been assisted with six new sites coming on line. As these new sites start to establish themselves, we expect the second half of the year to continue to improve.

2014 looks to be a significant year for HPS Pharmacies and the continued investment by the business in new contracts, sites, resources, technology and innovative programs is reaping benefits for employees and clients. The Finance team are excited to be part of this progression, providing the support and analysis to successfully achieve HPS Pharmacies' charter for growth.

Tracy Dickens

Human Resources Manager

Continuing professional development is pivotal to HPS Pharmacies, ensuring our employees continue to grow in their profession and throughout their entire career.

The ultimate outcome of well-planned continuing professional development is to provide HPS Pharmacies, our people and our clients with relevant professional development opportunities and to further educate on delivering a safe, efficient and professional service.

As industry leaders, HPS Pharmacies has delivered a resourceful and effective way to ensure our employees' professional development exceeds current standards of others in the same field.

With the introduction of eLearning last year, HPS Pharmacies' valuable digital learning and development solution, our employees have been provided with a deeper understanding of business relations, along with a greater appreciation of the implications and impacts of their work, such as risk management, leadership skills, and health and safety.

Research suggests positive flow-on effects for businesses implementing eLearning solutions nationally, including improved employee retention, increased morale, greater job competency and a better understanding and application of the compliance framework, which ultimately results in enhanced client satisfaction.

The HR team looks forward to further developing customised eLearning sessions that are specific to our client requirements.

Pharmacy Business

HPS introduces Tall Man Lettering

How easily one could confuse Aratac® with Arabloc®, cycloserine with cyclosporin, or Lanvis® with Lantus®, particularly when spoken or handwritten. The risk run is supplying an antiarrhythmic for an antiarthritic, an antibiotic for an immunosuppressant, or a cytotoxic instead of insulin. Confusion between similar medicine names has presented challenges to risk management for years, and preventing this type of mistake contributes to medication safety, one of the ten mandatory *National Safety and Quality Health Service (NSQHS) Standards*.

Tall Man Lettering uses a combination of upper and lower case letters to highlight the differences between similar names, and to provide an alert to those medicine names at risk of confusion. The examples then become arATAC®, arABLOC®, cyclosERINE, cyclosPORIN, lanVIs®, and lanTUs®. The *NSQHS Standards* recommend the application of the *National Tall Man Lettering* list in:

- Electronic medication management systems including prescribing and dispensing systems;
- Printed labels used for inpatient dispensing shelving in pharmacies and ward medicines cupboards; and
- Drug libraries for smart pumps.

Some manufacturers have modified their medicine labels, while HPS Pharmacies will be rolling out *Tall Man Lettering* through its Hospharm® software during March 2014. This will increase visibility for nursing staff on printed materials used in a clinical setting such as barcode shelf-tags in imprest cupboards, chemotherapy product labels, and mediSACHe® labels, however will not be displayed on medication profiles or dispensing labels for patients. It will also appear on printed reports distributed to clients.

HPS Pharmacies is excited to be a leader in adopting this national standard as a safety initiative. However it acknowledges these changes may be interpreted as typing errors until *Tall Man Lettering* is widely implemented, so HPS Pharmacies invite you to educate your peers.

Reference:

1. Australian Commission on Safety and Quality in Health Care. *National Tall Man Lettering*. ACSQHC; 2012.

Par-ent(er)al Demystified

Did you know fentanyl patches can be administered **parenterally**?

Of course the contents of any patch should only be applied topically, but common usage has narrowed the interpretation of parenteral, by many, to mean intravenous or at least injectable. This interpretation may have developed from the two routes of administration used for feeding patients i.e. **enteral** and **parenteral** feeding.

The term is based on the Greek word *enteros*, meaning "intestine", therefore "enteral" denotes anything administered via the gastrointestinal tract, including naso-gastric feeding and any orally administered medication. Interestingly this meaning also extends to the extremities of the gastrointestinal tract such as the absorption of sub-lingual tablets and rectal preparations via the local mucosa.

Parenteral incorporates *para*, another Greek word meaning "besides", as in parallel. In fact, parenteral signifies administration by any route other than via the gastrointestinal tract, thus application of a topical patch is parenteral, as is administration by injection.

Beware of computers with spell check, as it is not unusual to see "**parental administration**", which really only applies in a paediatric ward.

"Complements" to the English Language

Another term that causes confusion is "complementary", which often appears as "complimentary". Complementary has its roots in the Latin word complere, meaning "to complete". Complementary medicines are those which have not been proven to be therapeutic through clinical trials, but are used as adjuncts to conventional medical therapies. The TGA defines complementary medicines to include those particular ingredients which traditional health care practitioners have established through time and experience, including herbs, vitamins, minerals, nutritional supplements, homoeopathic and aromatherapy preparations.

A final word on spelling; these products are only ever complimentary if they are given free, they certainly can't express praise.

Pharmacists to administer vaccines in 2014 influenza season

As the aging demographic of medical practitioners continues to drive rethinking of effective ways to provide healthcare, pharmacists are preparing to trial a new service – administering vaccines.

The *Pharmaceutical Society of Australia* and the *Pharmacy Guild of Australia (PGA)* are launching a research pilot program, where the Queensland community will be offered pharmacist administered influenza vaccination in line with the start of the 2014 influenza season.

The *National Immunisation Program* currently offers free influenza vaccination to Australians aged 65 years and over, Aboriginal and Torres Strait Islanders aged 15 years or over and all pregnant women. These people should still access free vaccination through traditional avenues, while the pilot program will target those people who are not eligible.

The *Queensland University of Technology* and *James Cook University* are supporting the project to ensure a robust study design, and effective evaluation of the role of pharmacists in immunisation services.

While administering vaccines is an extension to the current services offered by pharmacists, the *Pharmacy Board of Australia* consider it to be a general, rather than advanced, level of practice and the competencies required for pharmacists to administer vaccines have been mapped to those of nurse immunisers.

Queensland Branch President of the *PGA*, Tim Logan, said "community pharmacies are the most accessible healthcare professionals and so we are a natural destination for the delivery of vital immunisation services."

Extending this service to whooping cough could stem the current epidemic in Australia, by potentially increasing vaccination rates to the 94% threshold needed to achieve herd immunity, through improved community access to professional advice and convenient administration.

Clinical trials conducted at Pacific Private

HPS Pharmacies has worked with *Tasman Oncology Research* since 2011 to provide patients access to new medications to treat cancer at Pacific Private Day Hospital and Allamanda Private Hospital.

Clinical trials give many cancer patients the opportunity to receive newly developed treatments which would otherwise be inaccessible. There is a significant time-delay between discovery of these life-saving medicines, registration, and availability on the Government funded *Pharmaceutical Benefits Scheme*; and for cancer sufferers, timely access to treatment is critical.

Patients may also be seeking success when current therapies have failed, or just hoping to contribute to the pool of knowledge about cancer treatment. They are inducted following referral from their current doctors and consideration of their eligibility for trial involvement.

Under the direction of Medical Oncologist Dr Andrew Hill, *Tasman Oncology Research* has recruited patients, and are conducting trials in the fields of colorectal and prostate cancers (including abiraterone, which you can read about on page 22), as well as several studies into metastatic melanoma.

A recently undertaken randomised, controlled trial saw the world's first Phase II dose of a novel dual-ligand monoclonal antibody for metastatic colorectal cancer, delivered at the Pacific Private Clinic on the Gold Coast.

HPS – Pacific Private work closely with the oncologists and research coordinators to provide exceptional care for all patients. The medications are prepared and dispensed on-site, allowing a precise, timely, and personalised approach for every patient.

Safety Issues of Fentanyl Patches

Sharon Anderson, Clinical Pharmacist
HPS – Modbury, South Australia

Fentanyl is a synthetic opioid similar to morphine in that it stimulates mu-opioid receptors in the central nervous system (CNS), altering the body's response to pain. It is the most potent opioid in human clinical use, and is 50 to 100 times more potent than morphine, depending on whether physiological or behavioural effects are measured.

Several years ago fentanyl was introduced to Australia as a transdermal system (Durogesic®, Fenpatch®, Denpax®). Fentanyl is released from the patches at an almost constant rate, driven by the concentration gradient between the matrix and the skin. A depot of fentanyl concentrates in the upper skin layers from where it enters the circulation. Serum levels increase gradually, reaching steady state concentrations after 24–72 hours.

Once the patch is removed, fentanyl release continues from the depot accumulated in the skin and this should be considered when managing overdose, or transferring to another opioid.

The mean half-life from the patch is approximately 20–27 hours, therefore significant blood levels remain after 24 hours. Withdrawal symptoms may occur in patients undergoing dose reduction, and a gradual downward titration, such as halving the dose every six days, is recommended. Patients with high blood urea nitrogen levels, have demonstrated low intravenous fentanyl clearance and so, due to the long half-life of fentanyl when administered as a transdermal system, those with mild to moderate renal impairment should be started on half the usual dose, and use should be avoided in those with severe impairment. Similar precautions apply to those with hepatic impairment, as fentanyl is metabolised by the liver.

Whilst morphine is the gold standard in treatment of severe pain, fentanyl has some advantages, mainly decreased emesis and constipation, increased safety with renal impairment, and in patients with swallowing difficulties. Like other opioids, fentanyl can produce respiratory depression, sedation, miosis, bradycardia, hypotension, euphoria and reduced gastrointestinal motility in addition to analgesia. Respiratory depression, which may be fatal, is the primary risk. There is a small margin between therapeutic and toxic doses.

Between 2000 and 2012, there were 136 fentanyl-related deaths in Australia; 77% were people under 47 years of age, and only 36% had a history of fentanyl being prescribed at the time of death, reflecting substantial illicit use and accidental death in children.

Acute overdose of fentanyl results in respiratory depression, sedation progressing to coma, muscle flaccidity, cold and clammy skin, constricted pupils, bradycardia and hypotension and may culminate in death. Hypoventilation can occur throughout the therapeutic range, especially for patients with an underlying pulmonary condition or who take prescribed or other CNS depressants (e.g. alcohol).

Treatment for acute overdose is via naloxone, a pure opioid antagonist. As the reversal is shorter than the duration of action of the fentanyl patch, the management of an overdose must be monitored carefully for at least 72–96 hours after. Documented deaths associated with the misuse of fentanyl patches encompass non-intentional, iatrogenic and illicit misadventure.

1. Non-intentional deaths have resulted from the following causes:

- Patches being transferred to children whilst hugging a patient.
- Patches found on the floor or in a bin by a child and applied to their skin, or sucked, chewed or swallowed. If chewed the full dose may be released. Fentanyl has more than a thirty-fold increase in absorption from the buccal mucosa if chewed and a ten-fold increase in gastrointestinal absorption if swallowed whole, compared to the transdermal route.
- Patches applied to mucous membranes and eyes.
- An external heat source (e.g. hot water bottle, electric blanket) promoting the temperature dependent release of fentanyl from the system, increasing skin permeability and local blood flow. Research shows that application of heat over a fentanyl patch increases the maximum fentanyl level by over 60%.
- Increased core body temperature from strenuous exertion, or fever due to infection.
- Leakage from the patch (which has been minimised with the introduction of a matrix "drug in adhesive" formulation).
- Misadventure by patients with cognitive impairment. The upper back is the preferred site to minimise the potential for inappropriate patch removal.

2. Iatrogenic deaths have resulted from the following causes:

- Administration to opioid naive patients, or patients with chronic obstructive pulmonary disease, other pre-existing respiratory issues (severe asthma, apnoea), or bowel blockages.
- Excessive initial dose. Conversion to the fentanyl patch equivalent dose, should be calculated from the total opioid intake over 24 hours of the drug previously used. Due to possible individual patient variation, it is safer to start with a conservative dose and titrate upwards if necessary. Use caution as a patch releasing 100mcg of fentanyl per hour is equivalent to approximately 350mg of oral morphine per day.
- A rapid dose increase. Patients should be titrated up from the lowest effective dose after no less than two, 3-day applications. Due to the delayed onset and the prolonged duration of action, respiratory depression should be monitored following initiation or dose increase.
- Application of a new patch before removal of the previous one (a used patch may still contain 40–60% of the original quantity of fentanyl).
- Prescription of patches to patients with severe hepatic impairment.
- Overdose in elderly patients due to altered pharmacokinetics, poor fat stores or muscle wasting. The mean half-life in patients more than 65 years old is prolonged to 34 hours. The elderly have a greater frequeny of decreased renal, hepatic and cardiac function, and of concomitant disease or other drug therapy.

3. Deaths related to illicit use have resulted from the following causes:

- Application of multiple patches to produce an intoxicating effect. A deceased patient in the USA was discovered wearing 51 patches.
- Misuse of patches obtained from corpses or discarded from aged care facilities (the SA Health website has a fact sheet addressing the safe disposal of patches).
- Injection of fentanyl extracted from new or used patches. The new matrix formulation lessens this problem, but they continue to be a source of 'creative misuse'.

Health professional responsibilities

Pharmacists should determine if patients are opioid tolerant and suffering from chronic pain. If a significant increase in the prescription strength is noted, the prescriber should be contacted.

Patient and carer education should include discussions concerning the indication, potency, dose, safety precautions (e.g. driving), adhesion (including hand washing after application), and the correct removal and disposal processes.

An existing patch must be removed before a new patch is applied (to a different area). Signs of toxicity, such as unexplained drowsiness, should be discussed.

Safe storage and use around children, who may mimic the patient and/or enjoy putting on stickers, must be highlighted. Patients should be informed that patches may transfer to someone in close contact, such as a child, a pet or another person sharing a bed. The use of a dosing calendar should be encouraged. Care should be taken when writing the date of application on the patch to ensure the pen does not puncture it.

Concomitant use of fentanyl patches with drugs that are cytochrome P450 3A4 inhibitors, such as clarithromycin, amiodarone, diltiazem, erythromycin, fluconazole, fluvoxamine, verapamil and grapefruit juice may increase plasma concentrations of fentanyl, which could increase or prolong adverse effects, including fatal respiratory depression.

Other CNS depressants should be avoided or closely monitored. Administration with drugs that increase the risk of serotonin toxicity may lead to serotonin syndrome. MAOI's are contraindicated. The risk that fentanyl patches may be abused or diverted, with possibly lethal results, should also be considered.

References for this article can be found in the online version published in the HPS Pharmacies Knowledge Centre.

To read more on this topic visit the HPS Pharmacies Knowledge Centre online: www.hpspharmacies.com.au

Drug Dosing in Obesity

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There is an obesity epidemic. Obesity is a worldwide problem with major health, social and economic implications. It has been caused by changes in diet and exercise as a result of increasing urbanisation and wealth in poorer nations. Changes to the diet have increased the availability of foods containing higher fat, higher salt, and higher carbohydrate levels, and is supplied to the consumer in larger portion sizes.

These issues have resulted in a population with an increasing percentage of overweight and obese people who may become patients in the medical system. Obesity itself causes an increased demand on the health system and a strong correlation has been shown between increased bodyweight and the prevalence of Type 2 Diabetes, heart disease, some types of cancer, and osteoarthritis.

How does Australia rate in these statistics?

Australia is now ranked as one of the top ten countries with the highest rates of obesity in the world.

State/Territory	Overweight Population (%)
South Australia	66.6%
Western Australia	65.2%
Queensland	64.9%
Tasmania	64.7%
Australian Capital Territory	62.2%
Northern Territory	62.1%
New South Wales	61.1%
Victoria	61.0%

Table 1. Percentage of overweight individuals in Australian States (Source: Australian Institute of Health and Welfare 2013)

The amount of lean body tissue does not stay the same as weight increases, but increases slightly, although not in a linear fashion in relation to total bodyweight. The increase in lean body weight (LBW) is shown in Table 2, as a percentage of the patient's total body weight.

	Fat body weight (%)	Lean body weight (%)
Lean	10%	90%
Normal	21%	79%
Obese	36%	64%

Table 2. Percentage of fat and lean body weight (% of total body weight)

People with obesity have a larger lean body mass and fat mass than non-obese persons matched on age, gender and height. However the percentage of fat per kilogram is markedly increased, while the percentage of lean tissue is reduced. Cardiac performance and adipose tissue blood flow may be altered and are usually reduced in obesity.

The adaption of drug treatment, particularly drug dosages for obese patients, is concerning and even more so with drugs that have a narrow therapeutic index. The factors which can affect the required drug dose are; the tissue distribution of drugs based on body composition, regional blood flow, and the affinity of the drug for plasma proteins and tissue components.

There is a growing literature base to suggest that the use of LBW, instead of ideal body weight (IBW), should be used to calculate drug doses to give a more accurate dose for overweight and obese patients. This is a sound suggestion, as 99% of the metabolic processes take place in lean body tissue.

It has also been postulated that there may be a relationship between LBW and hepatic functional capacity. Lean body mass is slightly different from fat-free mass because fat in cell membranes is included in LBW. Creatinine clearance can also be useful to assist in drug dosage calculations.

All patients admitted to hospital should be weighed as soon as possible after admission, to ensure this important information is available for consideration when determining drug doses.

What are the issues involved in calculating a drug dose?

- Clearance of drugs from the body is based on LBW;
- 99% of clearance occurs in lean tissue;
- Clearance is proportional to the LBW;
- Oral bioavailability is not affected;
- The effect on Vd (Volume of distribution) is related to the hydrophilic (water soluble) to lipophilic (fat soluble) ratio (e.g. for Phenytoin);
- Whether the dose should be capped to provide a maximum dose;
- What is the most accurate way to calculate the dose; and
- Which drugs are the most difficult to calculate.

There are many drugs with doses that are of concern for overweight patients, such as;

- Those with a narrow therapeutic index, such as gentamicin and vancomycin. Monitoring of the blood levels of these drugs to ensure that therapeutic level is rapidly achieved without adverse effects.
- *Australian Medicines Handbook* (AMH) recommends if a patient is >20% overweight, usually IBW is used to calculate the dose. Renal function must also be considered.
- An adjusted gentamicin dose can be calculated by:
  Adjusted weight = 0.4 x (actual weight - ideal weight) + ideal weight
- Individualised dosing should be based on concentration monitoring, for example therapeutic drug monitoring with a Targeted Concentration program such as *TCI Works®*.

Many hospitals provide guidelines for gentamicin and vancomycin with dose adjustments based on IBW or LBW.

Enoxaparin could be considered one of the most difficult drugs to dose accurately for an obese patient. Opinions differ widely about the most appropriate dose for overweight and obese patients. Many clinicians increase doses to a predetermined maximum dose up to a body weight of 100 or 120kg, for example:

- There is research into the use of a graduated dose regimen with 1 mg/kg twice a day if TBW<100kg and 1.5mg/kg if TBW>100kg.
- Trough Factor Xa levels can be useful to monitor therapeutic levels.
- Renal impairment should always be checked before doses are prescribed or given. The *Australian Medicines Handbook* recommends dose reduction in renal impairment if CrCl<30ml/min for enoxaparin.
- Gentamicin and vancomycin doses are also adjusted for renal function and will require extra monitoring if renal impairment is present.

Drug dosing in the overweight and obese patient remains a much debated issue with few clear guidelines available. Research is increasing in this area to give more clarity.

The increasing rate of obesity in Australia should be addressed urgently as a community to reduce the rates of overweight and obese people and improve the health of future generations.

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Medication Reconciliation and the NSQHS Standards

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Introduction

The latest version of the *National Safety and Quality Health Service (NSQHS) Standards* includes criterion regarding the reconciliation of medication on admission, transfer within the organisation and discharge to other healthcare settings. In particular, medication reconciliation (in conjunction with other policies, procedures and protocols) is critical for the following standards:

Regarding documentation of patient information, the *NSQHS Standards* specify:

> *"4.8 The Clinical Workforce reviewing the patient's current medication orders against their medication history and prescriber's plan, and reconciling any discrepancies.*
>
> *4.8.1 Current medicines are documented and reconciled at admission and transfer of care between healthcare settings."*

They go on to establish continuity of medication management by:

> *"4.12 Ensuring a current comprehensive list of medicines, and the reason(s) for any change, is provided to the receiving clinician and the patient during clinical handovers.*
>
> *4.12.1 A system is in use that generates and distributes a current and comprehensive list of medicines and explanation of changes in medicines."*

It is therefore imperative that hospitals have a plan for medication reconciliation moving forward.

What is medication reconciliation?

Medication reconciliation is defined by the *Australian Commission on Safety and Quality in Health Care (ACSQHC)* as "a formal process of obtaining and verifying a complete and accurate list of each patient's current medicines". Practically, this means comparing the medications patients are **actually** supplied to those which **should** be prescribed. Any identified discrepancies should have the reason for change documented, or be discussed with the prescriber.

This usually takes place when care is transferred so that a complete, current, and accurate list of medications is provided to those taking over the patient's care.

Medication reconciliation varies from a standard medication history, as it consists of a systematic interview process with the patient or family, and a review with at least one other source of information.

There are a number of tools available to aid in this process, most notably the national *Medication Management Plan*, however ultimately what is essential is that the process is followed as outlined by the *ACSQHC*:

1. Obtain a Best Possible Medication History (BPMH);
2. Confirm the accuracy of the history with a second source;
3. Reconcile the history with prescribed medicines; and
4. Ensure accurate medicines information during transfer of care.

When completed appropriately, medication reconciliation is "a conscientious, patient-centred, inter-professional process that supports optimal medication management".

Benefits of medication reconciliation

The medication reconciliation process has numerous positive outcomes, some of which are:

- Reduced medication errors;
  - Medication discrepancies occur in up to 70% of patient admissions/discharges, with approximately 30% of these having the potential to harm the patient.
- Reduced adverse drug reactions;
  - Potential reduction of 28% compared to usual care without medication reconciliation.
- Increased medication compliance;
  - Help patients maintain and understand medication lists, and gives the patient and their family the chance to speak up if they believe an error may have occurred.
- Potential to save time at discharge;
  - The process with discharge medication orders becomes more clear, accurate and efficient if a BPMH has been recorded early during admission.
- Achieve compliance with *NSQHS*.

These outcomes benefit patients upon admission into hospital, when discharged home, or when transferred to another facility.

When should medication reconciliation occur?

There is some conjecture over whether hospitals should target admission, discharge, or internal transfer events, as these are times which have been shown to increase the risk of medication discrepancies.

Practically though, medication reconciliation is usually best served within 24-48 hours of admission, so as to identify any potential medication errors early, and also to serve as a reference point for use at the time of discharge.

There is also an emerging trend towards more proactive medication reconciliation to be performed at pre-admission clinics prior to surgical admissions. The benefits of this model is that it reduces discrepancies prior to arrival at hospital, saves time during admission, and can also provide information to patients and prescribers regarding medications that may need to be withheld during the perioperative period.

Which patients should medication reconciliation be completed for?

Hospitals have limited resources, so it seems logical to target only those patients who would benefit most from medication reconciliation (i.e. high-risk patients). There is uncertainty however, regarding the criteria which define high-risk status, and furthermore this status may change during the hospital admission due to changes throughout hospitalisation which would elevate their risk status.

It is therefore suggested that all patients should have medication reconciliation completed; this eliminates the need for risk stratification and the potential to overlook high-risk patients. More importantly still, the *NSQHS* Standard 4.8 makes no mention of risk level, signifying that all patients must have reconciliation completed to meet the standard.

Who should complete medication reconciliation?

A systematic review of hospital-based medication reconciliation processes found the best evidence for successful interventions was in the use of pharmacy staff, particularly when targeting higher risk patients. There is also evidence to suggest that pharmacist-led medication reconciliation is the most cost-effective system.

Although the most proven professionals to carry out medication reconciliation, this can be an issue for wards without pharmacy services or limited pharmacy resources. Pharmacy involvement should also be careful not to overshadow the broader inter-professional approach to gathering a complete medication history.

Irrespective of who is carrying out the reconciliation, it is vital that the person has received formal training on how to complete the process, especially with regards to taking a BPMH. Pharmacists are ideally situated to lead the practice due to their specialised training, whether this is active involvement or education of other health professionals.

Implementing medication reconciliation

Many facilities will have some form of medication reconciliation already taking place, be that completed by doctors, nurses or pharmacists. The challenge for the future, and for accreditation purposes, is to have a meaningful, systematic and documented medication reconciliation process. Completing the minimum necessary requirements will do little to prevent serious adverse medication events occurring. Hospitals should invest adequate time, funds, and effort into developing robust and effective strategies.

Barriers to effective implementation include:

- Significant underestimation of time and resources required to implement medication reconciliation;
- Opposition from front-line staff due to effects on workload and work flow;
- A shortage of implementation/change management knowledge;
- Resource limits for ongoing education and support to maintain the implementation; and
- Implementing too quickly in order to meet accreditation timelines, causing a poorly designed process.

Support from senior management is crucial in ensuring a successful implementation. A collaborative approach between different health professionals and other health facilities is also of great help. Ultimately, careful organisational planning and change leadership is required for a successful implementation, and maintenance of effective medication reconciliation processes.

Conclusion

Medication reconciliation is now a key part of achieving *NSQHS* accreditation for all hospitals. There are significant benefits associated with effective medication reconciliation, which have benefits for both patients and service providers. Effective medication reconciliation can save time at admission or discharge, and can prevent medication errors. Implementing an effective process requires a coordinated approach and a substantial investment in time and resources. Pharmacy departments are ideally placed to assist in this process and have been proven to be effective and to offer best value.

References for this article can be found in the online version published in the HPS Pharmacies Knowledge Centre.

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Abiraterone (Zytiga®) for Prostate Cancer

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Prostate cancer accounts for approximately three out of every ten cancer diagnoses in Australian men. After lung cancer, it is the second most common cause of cancer death, due to its relatively high prevalence. However, compared to other cancers, it also has one of the highest survival rates; 92% at five years after diagnosis. The risk increases with age where approximately one in eight men are diagnosed with prostate cancer by the age of 85.

Androgens play a major role in promoting the growth of the prostate. Initially, most prostate cancers use testosterone (the main male androgen hormone) to enhance tumour growth. The first line treatment of prostate cancer is based on androgen deprivation therapy, which aims to reduce or obliterate testosterone levels.

As testosterone is primarily produced in the testes, therapies are directed at reducing testosterone production in this area. This can be achieved through treatment with luteinizing hormone releasing hormone (LHRH) analogues, which involves hormonal suppression of testosterone production through a negative feedback mechanism, or by orchidectomy (surgical removal of one or both testes).

Unfortunately, prostate cancer has the potential to grow despite lowering testosterone production in the testes. This is termed castrate resistant prostate cancer (CRPC). The enzyme cytochrome P (CYP) 17 is required for the production of testosterone and other androgens. This enzyme is primarily expressed in the testes, but is also found in the adrenal glands, and is relatively highly expressed in prostate tumour tissue. As a result, therapy which targets the testes alone may not be sufficient in treating prostate cancer.

Abiraterone is a new treatment option for CRPC, which acts by inhibiting CYP17, thus blocking the formation of androgens and decreasing testosterone levels. Unlike other testosterone lowering therapies, such as LHRH analogues, abiraterone blocks the production of testosterone in the adrenal glands and tumour, in addition to blocking production in the testes, due to the specific enzyme it targets. When abiraterone is given in combination with a LHRH analogue (or orchidectomy), testosterone levels have been found to be undetectable.

The evidence for the use of abiraterone is based on two randomised, double blind, placebo controlled, multicentre phase III clinical trials of patients with metastatic CRPC. All patients were using either a LHRH analogue or had previously had an orchidectomy. Patients were treated with abiraterone and prednisolone, or placebo and prednisolone.

In the first trial, the patients had all failed prior treatment with docetaxel. In this trial patients who received abiraterone had an increased overall survival rate compared to those who received placebo (median overall survival 15.8 months [95% CI 14.8-17.0] vs 11.2 months [10.4-13.1]; hazard ratio [HR] 0.74, 95% CI 0.64-0.86; p<0.0001).

The abiraterone group also showed improvement in the secondary end points of median time to prostate specific antigen (PSA) progression (8.5 months [95% CI 8.3—11.1] vs 6.6 months [5.6—8.3]) and median progression free survival on the basis of radiographic evidence (5.6 months [5.6—6.5] vs 3.6 months [2.9—5.5]).

In the second trial, patients had not received any prior chemotherapy. In this trial, patients who received abiraterone had a longer median time to initiation of cytotoxic chemotherapy (25.2 months vs 16.8 months; HR 0.58; 95% CI, 0.49 to 0.69; p < 0.001), among other secondary endpoints.

The overall survival for the abiraterone group was longer in this trial, but this was not statistically significant.

Abiraterone causes increased mineralocorticoid levels through inhibition of the CYP17 enzyme. This results in adverse effects such as peripheral oedema, hypokalaemia and hypertension. These effects are reduced by concurrent administration of a steroid (prednisolone), though they are still common. Prednisolone causes a reduction in the drive to produce mineralocorticoids, through suppression of the adrenocorticotropic hormone (ACTH).

The mineralocorticoid effects can exacerbate heart failure and arrhythmias (e.g. atrial fibrillation or tachycardia). Patients with

uncontrolled hypertension, myocardial infarction, arterial thrombotic events (within six months prior to initiation of treatment), severe or unstable angina, New York Heart Association class III or IV heart disease, or cardiac ejection fraction measurement of < 50%, were all excluded from the clinical trial. Caution is recommended when using abiraterone in these subgroups.

Other possible side effects include fatigue, urinary tract infection, increased risk of fractures, hot flushes, musculoskeletal pain, diarrhoea, vomiting, hypertriglyceridaemia, hypercholesterolaemia and elevated liver function tests.

Abiraterone should be taken on an empty stomach, at least two hours after, or one hour before, food. Food increases the absorption of abiraterone, however the safety of this has not been assessed. It is available in 250mg tablets; the usual recommended dose is 1g once daily, which can be reduced in response to toxicity.

Abiraterone is always given in combination with prednisolone, either 5mg twice a day or 10mg once a day (prednisolone should be taken with food). Abiraterone is cleared by the liver, hence it is not recommended in patients with moderate to severe liver disease.

Abiraterone is a CYP enzyme inhibitor, so it may reduce the metabolism of drugs affected by these enzymes. It is a strong inhibitor of the CYP2D6 and CYP1A2 enzyme-subgroups. Caution is advised when abiraterone is prescribed with drugs metabolised by, or activated by, CYP2D6; dose adjustments may be necessary.

One small in-vitro study found that when abiraterone was given with a single dose of dextromethorphan (which is metabolised primarily by CYP2D6), the concentration of dextromethorphan increased by 200%.

On the other hand, the same study showed the concentration of a single dose of theophylline (a CYP1A2 substrate) was not affected when given in combination with abiraterone (plus prednisolone). As abiraterone is a relatively new drug, patient monitoring is recommended to ensure any side effects or interactions can be effectively managed if they arise. Abiraterone is also a moderate inhibitor of CYP2C9, CYP2C19 and CYP3A4/5; the clinical significance of this is still unknown but thought to be minor.

Abiraterone has recently been listed on the *Pharmaceutical Benefits Scheme (PBS)* for the treatment of metastatic CRPC in patients who have failed treatment with docetaxel due to resistance or intolerance, and who have a *World Health Organisation* performance status of two or less.

As with many chemotherapy treatments, the treatment will no longer be subsidised if disease progression occurs while the patient is on abiraterone. To qualify for the subsidy, the treatment must be in combination with prednisone or prednisolone, and must not be used in combination with other chemotherapy.

Abiraterone has a unique mechanism of action which justifies its place in therapy as a third-line treatment. Previously only available privately at a high cost to the patient, it is a welcome addition to the *PBS*, providing another treatment option for patients with castration resistant prostate cancer.

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Clinical Article

Creating the HPS Lecture Series: A Pharmacist's Perspective

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The preparation of a lecture to be included in the *HPS Pharmacies Lecture Series* programme can be a challenging, yet rewarding, endeavour. When writing a lecture, the author must ensure: an appropriate level of content is included, the lecture is brief enough to be delivered in a timely manner, and also ensure it is engaging for the audience (and for those who present it).

The *HPS Pharmacies Lecture Series* is targeted primarily at a nursing audience, and may also be relevant for others in the broader healthcare team. The lectures are designed to be as concise as possible to enable efficient delivery of pharmaceutical education, perhaps formally at an allocated time during a shift, or informally during hand-over so attendees can obtain the information they require before launching back into their busy day.

At the beginning of each year, HPS Pharmacies' pharmacists are invited to volunteer to prepare a lecture to be included in the *HPS Pharmacies Lecture Series*. There are 12 lectures covering a wide variety of topics to be compiled for the series each year, although pharmacists are encouraged to submit additional lectures. Topics are compiled using suggestions from clients, feedback delivered as part of HPS' annual client surveys, or through the needs of clients as identified by our pharmacists.

Pharmacists invest long hours into the preparation of a lecture, researching the topic and collating the most up-to-date information available. A wide range of references are often referred to, such as the *Australian Medicines Handbook*, *MIMS*, *Therapeutic Guidelines*, and many more. Each lecture includes a list of references. This enables the presenting pharmacist to refer to the original references if they would like to modify the presentation, and also allows attendees the ability to view the original references, or to engage in further research following the lecture.

A pharmacist writing a lecture is encouraged to follow guidelines provided by HPS Pharmacies, ensuring the lecture notes follow a predetermined structure which is easy to follow, intuitive, and consistent between each lecture. A lecture is usually around 3,000 words long due to the volume of relevant information that is important to include. As a result, the pharmacist will select the most relevant information to present for their client, and most pharmacists will also distribute a handout of the lecture material for further reading.

The quantity of technical information included in the lecture depends largely on the topic and how broad it is. Based on the needs of the nursing staff, the author will focus on the most pertinent and relevant information, adding other useful or interesting information where possible. This can be challenging for the author, as pharmacists may prioritise aspects of the medicine which are not commonly observed in nursing practice. It is important to ensure the content of the lecture is relevant to the various attendees' areas of practice, so they will get the most value from their attendance and is as beneficial as possible.

Once the lecture is written and finalised, it is then distributed to all pharmacists at HPS Pharmacies to deliver to their respective clients. Prior to delivering any lecture from *HPS Pharmacies' Lecture Series*, the pharmacist familiarises themselves with the topic and content to ensure that their knowledge of the subject is up-to-date so as to confidently deliver the lecture, and also competently respond to any questions the lecture attendees may have. The author may even modify the content to suit the requirements of their individual clients, who can have vastly different learning needs.

Available From	Topic Title	Topic Summary
1st January	Medication options for analgesia	Exploring options in analgesia, with a focus on pharmacologic classes such as non-opioid analgesia, adjuvant analgesics and more.
1st February	SAS drugs and special requirements	An explanation of the Special Access Scheme (SAS) and how unregistered therapeutic goods medications can be obtained.
1st March	Vitamin D and calcium supplementation and use of vitamin D in multiple sclerosis	A discussion of vitamin D and calcium supplements and the rationale for use; with a specific focus on multiple sclerosis.
1st April	Pain management in palliative care	Exploring the options for pain and symptom management with an emphasis on medications which may be used in palliative care.
1st May	Medications used in the treatment of diarrhoea	Examining the several approaches to manage diarrhoea including antimotility, antispasmotic medications, and rehydration.
1st June	Code Stroke – including pharmacology of alteplase, icatibant and labetalol	A lecture discussing the certain medications used in the process of Code Stroke; including pharmacology of alteplase, icatibant and more.
1st July	Treatment of alcohol dependence	Examining the issue of alcohol use disorder in Australia, and the complications and treatment approaches for alcohol dependence.
1st August	Medications used to treat hyperlipidaemia	Analysing the rationale for drug use, healthy lifestyle changes, current drug choices, and the safety and efficacy of these medications.
1st September	Drug treatment of Inflammatory Bowel Disease (IBD)	An outline of inflammatory bowel disease and the rationale behind current drug therapy.
1st October	Antibiotic resistance and appropriate use	A discussion of antimicrobial stewardship and appropriate use of antibiotics to reduce resistance by applying suitable guidelines.
1st November	Medications used in renal failure	An analysis of medications which are specifically used in patients with renal failure, with a view to treat problems that may arise.
1st December	Medication management and hospital accreditation standards	An overview of the *Australian Council on HealthCare Standards (ACHS)* and the impact on hospital accreditation, with particular reference to *Standard 4 – Medication Management*.

Table 1. HPS Pharmacies' 2014 Lecture Series Timetable

Composing a lecture which is delivered to a wide audience, by a large number of peers, can provide immense satisfaction and pride in one's own work. It can increase the profile of a pharmacist amongst their peers, within HPS Pharmacies, and the wider healthcare profession. It also helps the pharmacist to gain a broader and more up-to-date understanding of the topic to apply in their daily work, or to share their extensive knowledge on the subject (if it is their speciality).

In addition, just as attending a lecture can be counted towards a nurses' Continuing Professional Development (CPD), compiling a lecture also contributes towards a pharmacists' CPD.

Topics covered in *HPS Pharmacies' 2014 Lecture Series* are listed in Table 1, and I strongly encourage you to take the time to attend one to see what all the fuss is about.

Editor's Note: *Visit the HPS Pharmacies Knowledge Centre to access the Lecture Series articles: http://www.hpspharmacies.com.au/knowledge-centre/*

To read more on this topic visit the HPS Pharmacies Knowledge Centre online: http://www.hpspharmacies.com.au

Parenteral Iron

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Introduction

Iron supplements may be used to treat anaemia. Anaemia is a relatively common problem and according to the *World Health Organisation (WHO)*, anaemia is characterised by a haemoglobin (Hb) level below the minimum of the usual reference range; that is less than 130g/L in men, 120g/L in women, and 110g/L in pregnant women and pre-school children. Signs and symptoms will usually appear when the Hb falls below 100g/L.

Australians at increased risk of iron deficiency anaemia (IDA) include children, and women of child-bearing age, especially those women who are pregnant. The *WHO* estimates up to 10% of pre-school children, and 10-15% of women in their reproductive years may be suffering from anaemia.

In Australia, most cases of anaemia are related to a deficiency of the crucial nutrients iron, vitamin B12 and folic acid, combined with high physiological requirements, or are related to blood loss.

Blood loss may be the result of gastrointestinal irritation, menstruation, blood donation, or other causes. Anaemia of chronic disease may affect hospitalised or institutionalised patients.

The majority of people with IDA will be managed on oral therapy, but some may require parenteral therapy if they are intolerant of oral preparations or have poor uptake of oral iron therapy.

Parenteral Therapy

Parenteral administration describes anything taken into the body, or administered, in any manner other than via the digestive system. There are three iron preparations available in Australia for parenteral use:

1. Iron polymaltose complex (Ferrum H®, Ferrosig®): contains 100mg iron in each 2mL ampoule;
2. Iron sucrose complex (Venofer®): contains 20mg iron/mL (i.e. 100mg elemental iron/5mL ampoule); and
3. Ferric carboxymaltose (Ferinject®): contains 100mg iron in 2mL.

Ferrum H® and Ferrosig® are both available on the *Pharmaceutical Benefits Scheme (PBS)*. However, Venofer® is currently only available on the *PBS* as an authority prescription for iron deficiency in renal patients on chronic haemodialysis, who are having epoetin or darbepoetin, and who have a documented hypersensitivity to the polymaltose formulation. Ferinject® is not currently available on the *PBS*.

Administration

Only iron polymaltose can be given by intramuscular (IM) injection and Ferrum H® is licensed for administration by this route, where Ferrosig® is also licensed for intravenous (IV) infusion.

There is some debate as to whether Ferrum H® can also be used intravenously. Ferrum H® has been administered for IV use in many facilities for a number of years without any issues, but it is not indicated for IV use in the product information, and therefore any IV administration is considered to be off license.

The intramuscular route is reserved for use in situations when an intravenous infusion is not practical. Intravenous administration is the preferred route, as even though intramuscular administration of iron is effective; it is poorly absorbed, local reactions (particularly pain and subcutaneous discolouration) occur frequently at the injection site, and it is no safer than IV administration. It should never be injected into the arm or other exposed areas due to the risk of persistent discolouration of the skin.

There is a specific technique for administration; the Hochstetter method. The manufacturer's product information provides information and diagrams for using the Hochstetter method. This is important in order to avoid pain and minimise skin staining.

Other adverse effects include local inflammation with inguinal lymphadenopathy, and lower quadrant abdominal pain.

Intravenous infusions of iron polymaltose (Ferrosig®), iron sucrose (Venofer®) and ferric carboxymaltose (Ferinject®) injections have different dosing regimens, different infusions rates, and are not interchangeable.

Allergic Reactions

There has been concern regarding severe allergic reactions associated with IV administration of iron but these have been largely allayed. A safety audit on 400 infusions of the polymaltose formulation used across Australia identified only minor side effects during the actual infusion process, whilst approximately 25% of patients experienced headache, fever and arthralgias up to two days after the infusion. It is still advised that IV administration is conducted at sites such as hospitals, which have the skills and equipment to manage any severe allergic reactions, should they occur.

Iron polymaltose and ferric carboxymaltose are given as a total dose infusion. The incidence of cross reactivity is unknown and therefore patients allergic to iron polymaltose should not receive ferric carboxymaltose, without prior consultation with an expert.

Iron sucrose (Venofer®) is given as multiple smaller doses, usually 100-200mg, by slow IV injection, rather than as an infusion. It gives a more rapid rise in Hb. Due to restrictions on the *PBS* it is not commonly used in Australia, but it is widely used overseas for treatment of IDA and has a good safety profile.

Oral therapy may be necessary after an iron infusion, but should not be (re)started until at least one week after the last iron infusion.

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Potassium, Plasma and Drugs

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Potassium is the primary intracellular cation in the blood. Most intracellular potassium is contained within muscle cells. Together with sodium it plays a role in maintaining osmotic balance. The ratio between intracellular and extracellular potassium concentration influences cell membrane polarisation, which in turn influences important cell processes, such as nerve impulses and muscle cell (including myocardial) contraction. Potassium is also involved in acid-base balance.

The normal physiological value of plasma potassium is 3.4-4.5mmol/L and serum potassium is 3.8-4.9mmol/L. Serum potassium is higher than plasma as a result of contamination by intracellular red blood cell potassium.

Hyperkalaemia

Hyperkalaemia occurs when serum or plasma potassium exceeds 5mmol/L. Hyperkalaemia is usually asymptomatic until cardiotoxicity occurs. Signs and symptoms of hyperkalaemia are muscle weakness and abnormalities of cardiac conduction.

The most common cause of hyperkalaemia is chronic renal disease, where renal potassium excretion is diminished. Additionally, hyperkalaemia occurs when there is transcellular movement of potassium out of cells, such as in the case of metabolic acidosis.

Insulin is responsible for moving potassium into cells hence hyperglycaemia, and in the presence of insulin deficiency, causes potassium to move out of cells. This raises plasma potassium.

When muscle fibre breaks down in rhabdomyolysis, potassium leaks out from muscle cells and causes an increase in plasma potassium.

Drugs can also increase plasma potassium. Examples are: potassium sparing medication (spironolactone, amiloride, triamterene), potassium supplements (including glucosamine potassium chloride complex), angiotensin converting enzyme inhibitors (perindopril, ramipril), trimethoprim, non-steroidal anti-inflammatories, digoxin toxicity, and suxamethonium.

The risk of hyperkalaemia increases when these medicines are used together, especially when combined with potassium supplements. If potassium is supplemented intentionally, serum potassium and renal function should be monitored to manage the risk.

Treatment of hyperkalaemia depends on the clinical context and degree of urgency. Electrocardiograph (ECG) is often used to assess the degree of urgency. For example, if there are ECG changes, ventricular arrest is likely, and hence is considered urgent. ECG changes occur when serum potassium is more than 5.5 mmol/L.

Initial changes in ECG (Figure 1) are shortening of the QT interval and tall, peaked T waves.

As serum potassium increases further, there is widening of the QRS complex, PR interval prolongation and disappearance of the P wave. Finally, the QRS complex degenerates into a sine wave pattern resulting in ventricular fibrillation.

Emergency treatment for hyperkalaemia is calcium gluconate 10% 10ml, given intravenously over two to three minutes into a large vein with ECG monitoring of the response. The response is immediate but not long lasting. The dose should be repeated if symptoms recur. Calcium works by antagonising the effect of hyperkalaemia on cardiac muscle excitability, but does not lower serum potassium. Intravenous glucose and insulin are usually given next, to promote cellular uptake of potassium. Short acting insulin (ten units) is usually given as an intravenous bolus, along with glucose 50% 50ml over five minutes. Glucose is not given if the patient is hyperglycaemic.

If metabolic acidosis is present, intravenous sodium bicarbonate 8.4% 50ml is given over 5-10 minutes under ECG control. This may be repeated in 60-120 minutes.

Salbutamol may be given intravenously or via nebuliser to stimulate the sympathetic nervous system and help shift potassium into cells. Frusemide is also used to increase potassium excretion, provided the patient is not renally impaired.

Potassium can be removed from the bowel lumen in exchange for sodium, by administering sodium polystyrene sulfonate 15g orally (suspended in 50-100mL of water), three to four times daily. Onset of action is slow (1-2 hours), hence it should not be used first-line in an emergency situation. Electrolyte disturbances are common and electrolytes should be monitored regularly while undergoing treatment. Side effects like constipation can be managed with laxatives. It should be noted that laxatives containing sorbitol should be avoided due to the risk of colonic necrosis.

Finally, haemodialysis can be performed in patients with renal failure or if emergency treatment is ineffective.

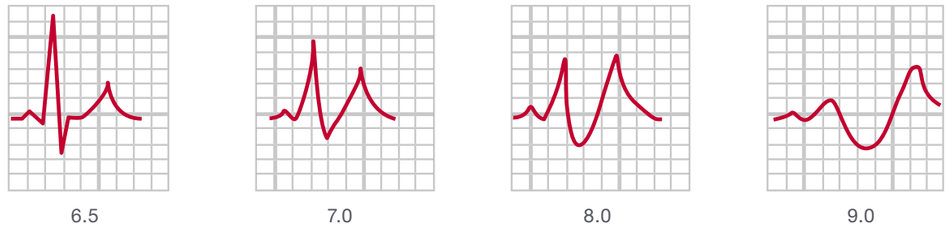

Figure 1. ECG patterns in hyperkalaemia.

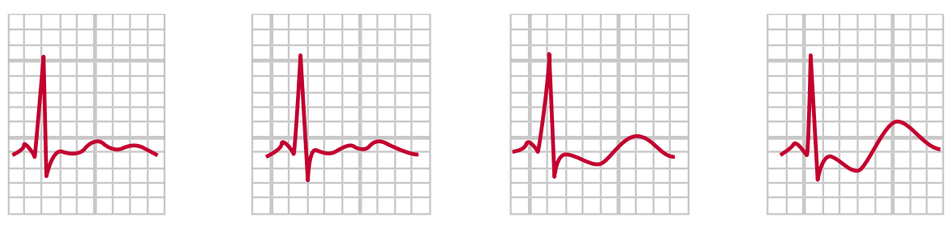

Figure 2. ECG patterns in hypokalaemia.

Hypokalaemia

Hypokalaemia is when the level of serum potassium is less than 3mmol/L. The main clinical features of hypokalaemia are: impaired muscle function (i.e. weakness, muscle fatigue, cramps and myalgias) and cardiovascular symptoms (hypertension and cardiac arrhythmias).

Cardiovascular symptoms occur when the serum potassium is less then 3mmol/L.

The ECG patterns in hypokalaemia (Figure 2) show initial sagging of the ST segment, depression of the T wave and elevation of the U wave. As serum potassium decreases further, the T wave becomes inverted or increasingly smaller and the U wave becomes larger.

The consequences are ventricular and atrial tachyarrhythmias, and second or third degree atrioventricular block.

Causes of hypokalaemia are usually due to losses from the kidneys or the gastrointestinal tract (vomiting and diarrhoea).

Drugs like diuretics cause hypokalaemia by enhancing renal excretion. Other drugs with similar effects are high dose penicillins (ampicillin, penicillin), mineralocorticoids, aminoglycosides, amphotericin B and cisplatin.

Some drugs cause hypokalaemia by shifting potassium into cells. Examples are: insulin, beta 2 agonists such as terbutaline, caffeine and theophylline.

Identifying the route and cause of the loss of potassium is important in determining the treatment for hypokalaemia. When hypokalaemia is persistent and unresponsive to treatment, continuing loss could indicate the possibility of anorexia, acid-base disturbances, magnesium deficiency, or diuretics and laxatives being abused as weight loss agents.

Replacement can be initiated with oral potassium chloride (KCl) supplementation at a dose of 1200-3600mg daily. Potassium can cause gastric irritation and sometimes bleeding, hence it is recommended to be taken with food, in divided doses. Liquid KCl is effective in increasing levels within two hours, however is poorly tolerated due to its bitter taste.

The parenteral form is given in severe cases, where muscle paralysis is present or where cardiac rhythm disturbance relates to hypokalaemia. The dose of intravenous potassium chloride is 30mmol/L given over 3-12 hours. Potassium concentration should not exceed 40mmol/L and the rate of potassium infusion should not exceed 10mmol/hour to avoid potential heart block and fatal hyperkalaemia.

In the emergency treatment of diabetic ketoacidosis or hypokalaemia induced arrhythmia, the rate of infusion could be increased, however caution should be taken to monitor potassium concentration, ECG, and fluid balance regularly. Intravenous potassium is given in saline containing solution rather than dextrose, as dextrose could trigger the release of insulin which promotes movement of potassium into cells.

Potassium sparing drugs such as amiloride and spironolactone increase serum potassium by decreasing its renal excretion. Both are usually prescribed to prevent diuretic induced hypokalaemia when oral potassium is not tolerated. The recommended dose for amiloride is 5mg to 10mg twice daily, while the dose for spironolactone is 50mg to 100mg twice daily. Initial response to treatment should be reviewed every one to two weeks to avoid the risk of hyperkalaemia.

References for this article can be found in the online version published in the HPS Pharmacies Knowledge Centre.

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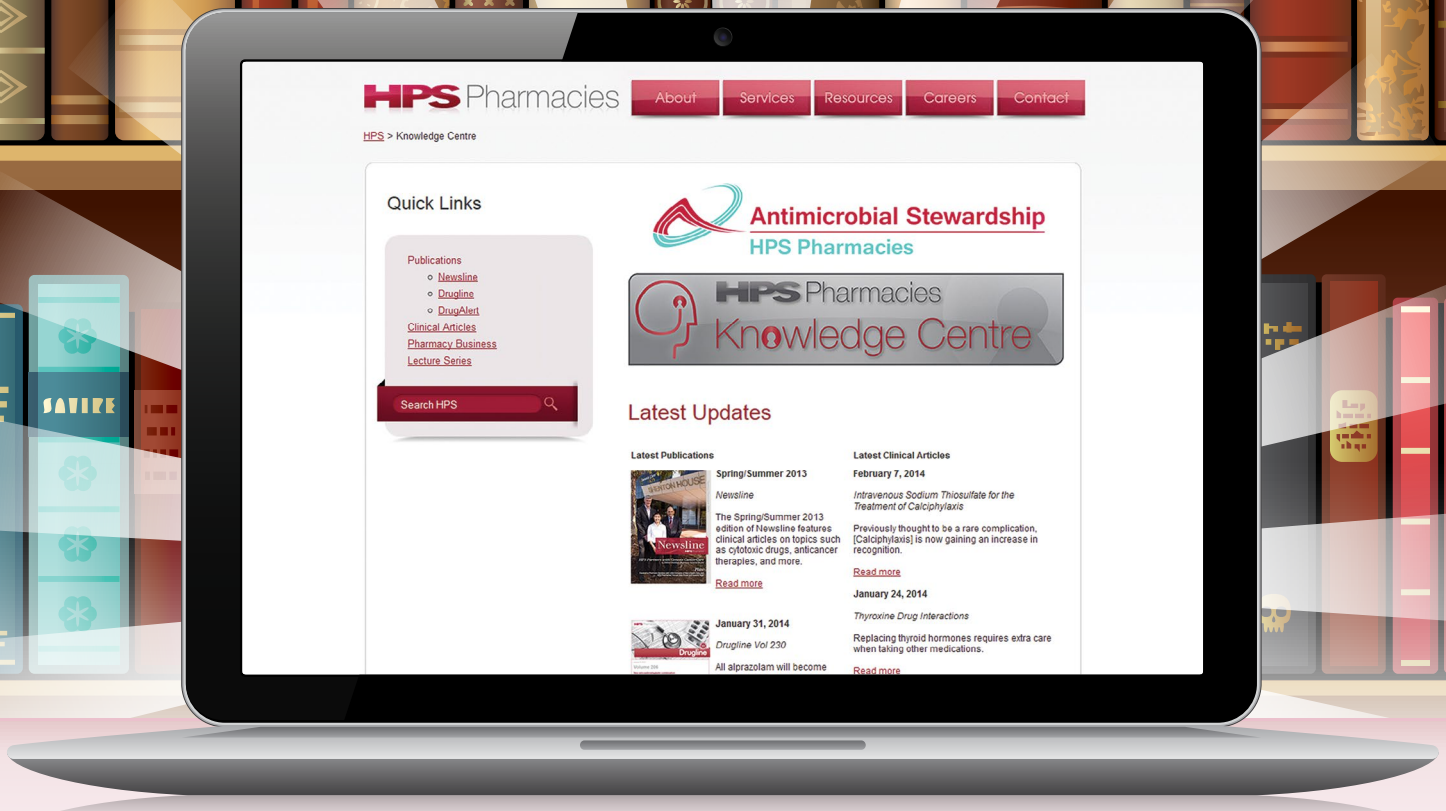

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