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Unleashing Innovative Wound Care Solutions

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The incidence of wounds is rising, especially in the Asia-Pacific (APAC) region. In Australia alone, 420,000 individuals are impacted by chronic wounds, leading to direct healthcare costs of AUD $3 billion, representing 2 per cent of the country's total healthcare expenditure. Similarly, data from Singapore between 2000 and 2017 revealed that the incidence of wounds among hospitalised adults was 300 per 100,000 for those over 18 and 800 per 100,000 for those over 50. Let's explore further.

In March 2024 the Albanese Government announced over $3 million fund for new initiatives to tackle the hidden epidemic of chronic wounds in Australia. It is estimated that approximately 450,000 Australians currently live with a chronic wound.

Wounds Australia and the Australian College of Nursing (ACN) will receive grants to enhance wound care education and awareness. Wounds Australia will use $2 million to launch a national campaign focused on chronic wound prevention and treatment, aiming to improve public awareness and patient knowledge. ACN will receive $1.073 million to fund scholarships for nurses and Aboriginal Health Workers, enhancing wound management in primary care settings.

In Singapore, the Wound Care Innovation for the Tropics (WCIT) program represents a pioneering research initiative focused on wound care in tropical climates. This programme aims to transform chronic wound care, improve health outcomes, and reduce economic burdens in the region.

Advancements in wound care

Recent breakthroughs in smart bandages, hydrogels, and tissue regeneration are setting the stage for a new era in chronic wound treatment. Chronic wounds, such as diabetic ulcers, surgical wounds, and pressure injuries, present significant health risks. These wounds are susceptible to infections, have prolonged healing times, and can result in serious complications like sepsis or amputation. Globally, around 2 per cent of people are affected by these conditions.

Smart bandages are advanced wound coverings that incorporate technology to optimise the tissue repair process. Equipped with various sensors, these bandages detect, record, and regulate physical and chemical factors that influence the rate of wound healing. By providing real-time data, smart wound bandages enable wound care experts to effectively plan,

prognosticate, and manage acute to chronic wounds of various etiologies compared to traditional bandages.

A research team led by Professor Lim Chwee Teck at the National University of Singapore has developed a cutting-edge smart wearable sensor for chronic wound assessment. Integrated into the VeCare platform, this sensor provides real-time, point-of-care data on temperature, pH, bacteria type, and inflammatory factors through a mobile app. The system includes a wound-sensing bandage, electronic chip, and mobile application, allowing comprehensive analysis within 15 minutes. Featuring a microfluidic collector and flexible immunosensor, VeCare enhances fluid delivery and ensures accurate detection of chronic wound biomarkers, regardless of wound size or shape.

Similarly, researchers have developed smart wound dressings with built-in nanosensors that glow to alert patients when a wound is not healing properly. These multifunctional, antimicrobial dressings feature fluorescent sensors that glow brightly under UV light if infection begins to set in, allowing for monitoring of the healing process. The smart dressings, developed by a team of scientists and engineers at RMIT, leverage the powerful antibacterial and antifungal properties of magnesium hydroxide.

Cuprina, a Singapore-based medtech company, specialises in developing products to treat chronic wounds. One of its products, MEDIFLY, is a bio-dressing made of live, medical-grade maggots, used in both private and public hospitals in Singapore and Hong Kong for Maggot Debridement Therapy (MDT). Clinically proven to reduce amputation rates and eliminate infections in chronic wounds, especially diabetic foot ulcers and pressure ulcers, MEDIFLY is ISO 13485 certified and registered with the HSA as a class C medical device. Cuprina is also developing collagen wound dressing products derived from bullfrog skin, which have shown promising results in wound healing.

Hydrogels are engineered materials that absorb and retain water, making them useful in medical treatments like wound dressings. However, they often adhere indiscriminately to all surfaces, risking damage to delicate tissue during healing. Additionally, conventional hydrogels lack inherent antibacterial properties and often rely on antimicrobial drugs or metal ions, which can contribute to antibiotic resistance and hinder cell growth. To address these challenges, companies and researchers are developing advanced hydrogels with improved properties. Chinese startup Lingel Tech focuses on wound care. The company's core technology involves the use of photo-crosslinked hydrogels for wound dressings, tissue sealants, adhesives, and hemostats. These advanced hydrogels aim to address some of the limitations of traditional hydrogel dressings.

Researchers from the University of Sheffield and the University of South Australia have developed a novel method to enhance hydrogel dressings, offering a promising solution to antibiotic-resistant pathogens. Their approach involves plasma activation of hydrogel dressings, utilising a unique mix of chemical oxidants. This method not only effectively decontaminates wounds but also aids in the healing of chronic wounds, including diabetic foot ulcers and internal injuries.

Tissue regeneration focuses on repairing or replacing damaged tissues to restore normal function. New Zealand-based Aroa Biosurgery is at the forefront of this field, developing and distributing advanced medical and surgical products designed to enhance healing in complex wounds and soft tissue reconstruction. Similarly, Australian firm AVITA Medical is revolutionising wound care and skin restoration through its innovative devices. Their FDA-approved RECELL system is specifically designed for the treatment of thermal burn wounds and full-thickness skin defects, as well as for the re-pigmentation of stable depigmented vitiligo lesions. AVITA Medical also holds exclusive rights in the United States to market and distribute PermeaDerm, a biosynthetic wound matrix, further advancing the possibilities in tissue regeneration and wound management.

Novel Therapies for wound infections remain limited, with only three FDA-approved treatments available for surgical wound infections, and no non-antibiotic options currently in development globally, according to GlobalData. Additionally, 25 therapies previously marketed for surgical wound infections have been withdrawn over the years.

"Proper care for chronic wounds was transformed in the 1990s with the acceptance of moist wound healing as the standard of care. These basic moist wound dressings have been the mainstay of the market since that point. Except for negative pressure and some of skin substitutes, no new technologies or therapeutics have meaningfully changed the trajectory of wound healing since then. The majority of chronic wounds require debridement of nonviable tissue to heal in a timely fashion. Current methods are either literally painful or painfully slow. Our drug under development, EscharEx, aims to change that dynamic by providing fast and safe debridement. It will achieve in 5-6 days what the current standard of care enzymatic debridement drug achieves in around 6-8 weeks. This will have a significant impact on the clinical and economic outcomes associated with chronic wounds," said **Ofer Gonen, CEO of MediWound, Israel**.

The Australian company Argent BioPharma has announced a strategic collaboration with SINTEF, one of Europe's largest independent research organisations, to tackle chronic wound management through innovative nano-formulations. This collaboration will focus on developing nano-encapsulated active ingredients to target chronic wound infections. These ingredients, many of which have not been used as antimicrobial agents before, will be carefully selected and dosed to

enhance their effectiveness while supporting antimicrobial stewardship. The project also emphasises the design of nano-formulations to improve drug delivery and pharmacological efficacy, offering a promising new approach to wound care.

These advancements are leading to better ways to treat even the most difficult wounds, which will ease the burden on healthcare systems and improve patients' lives around the world.

Ayesha Siddiqui