The Australian Medical Sheepskin and Pressure Ulcers

Pressure ulcers (bed sores or decubitus ulcers) are preventable adverse events that are both common and costly throughout healthcare institutes worldwide. They are a major problem to hospitals and healthcare institutes by increasing the patient length of stay, adding a potential secondary site of infection and causing unnecessary pain and suffering to the patient. A national survey in the United States reported a prevalence of 14.8% across 365 acute hospitals\(^1\). A pressure ulcer of Stage 2 or higher has been calculated to increase patients’ costs by a factor of 2.7,\(^2\) while the annual cost of pressure ulcers to the American healthcare system is estimated at $US3.6 billion \(^3\).

Clinical randomised controlled trials conducted in Australia at the Royal Melbourne Hospital have demonstrated that the Australian Medical Sheepskin (AMS) is able to reduce the incidence of Stage 1 and Stage 2 pressure ulcers by 58% compared to the control group (normal hospital care) in general hospital inpatients at low to moderate risk of developing a pressure ulcer \(^4\). The general hospital population was aged 18 to 99 years. This study was funded by the NHMRC (National Health and Medical Research Council) the pre-eminent medical research funding body in Australia.

Another clinical trial was performed in the orthopaedic wards at two major hospitals, Fremantle Hospital and Hollywood Private Hospital in Western Australia focusing on patients older than 60 years of age \(^5\). These studies also found that the use of AMS significantly reduced the incidence of pressure ulcers compared to the control group.

Pressure ulcers are graded from Stage 1 to Stage 4 \(^6\). All ulcers have the ability to progress from Stage 1 through to Stage 4 if no intervention is initiated. There are many factors at work for the development of a pressure ulcer. The Australian Medical Sheepskin (AMS) was developed to reduce the extrinsic factors associated with pressure ulcer development (viz. moisture, friction and shear forces). This was achieved by utilising wool’s natural ability to absorb water \(^7\) and the correct selection of wool fibre diameters to reduce friction and shear forces experienced by the patient. Furthermore, by ensuring a minimum wool-pile height of 25 mm combined with the high density of wool fibres per unit area (due to the selection of Australian merino cross-breeds), the interfacial pressure between the patient and underlying surface could be reduced.

In order for the product to survive institutional laundering a chrome-tannage was developed that allowed the woolskin to be repeatedly washed at 80\(^\circ\)C and tumble dried at 60\(^\circ\)C. The product needs to have a hydrothermal shrinkage temperature greater than 110\(^\circ\)C. Commercial AMS products have been laundered more than 100 wash and dry cycles.
The AMS is fully specified by an Australian Standard (AS4480.1)\(^8\) and is a superior product compared to earlier woolskin underlays.

Historically, woolskins have been used for some time for the prevention of pressure ulcers especially for immobile patients. Medical sheepskins have been advocated since the early 1960’s when research papers appeared \(^9\)-\(^12\) on clinical trials, woolskin processing and laundering. Whilst the results of the clinical trials and anecdotal evidence generally support the effectiveness of woolskin in preventing pressure ulcers, the studies lacked rigor.

The Australian Wool Corporation (AWC) and the International Wool Secretariat (IWS) developed specifications for these earlier products \(^13\). However, the specifications were not good indicators of performance, particularly for the repeated washing of the leather substrate, which is critical to the success of the product. The woolskin needs to have a tannage which produces supple leather with a high thermal stability, capable of frequent washing at high temperatures and tumble drying. Due to a proliferation of sub-standard products in the market place in the 1980’s and early 90’s, the inadequate AWC / IWS specification, and problems with the laundering of some products, the CSIRO Leather Research Centre obtained funds to develop a new range of specifications for medical sheepskins and incorporate these into an Australian Standard which was underpinned by hospital clinical trials.

In order for the new Australian Medical Sheepskin to receive recognition from international Evidence Based Medicine Review groups (i.e. Cochrane Collaboration) the new product needed to be to fully specified by a new standard and exposed to rigorous randomised controlled clinical trials in major hospitals.

These issues were addressed by reviewing the medical sheepskin supply chain from the raw material to the finished product. The work encompassed the following elements:

- Identification of the optimum raw material for comfort and performance
- Specification of the product for high level thermal disinfection (AS4146-1994)
- Development of an Australian Standard which identified specifications and performance criteria
- Improved durability of woolskins to laundering
- A marketing program to promote the new product
- Clinical trials to evaluate the efficacy of the Australian Medical Sheepskins

**Development of an Australian Standard**

Australian Standard AS4480.1 (Textiles for health care facilities and institutions – Medical sheepskins) was developed by an invited committee to give some objectivity to the supply chain through measurement and subjective assessment.
The standard provides a basis for the improvement of the medical sheepskin. Manufacturers and suppliers of medical sheepskins are given a set of requirements for product specification and testing. These include specifications for the wool pile and the leather substrate, which need to be durable to repeated washing under severe conditions.

The specifications for the wool pile are:

- Fibre diameter range 26 - 34μm
- Pile height minimum 25mm in a washed state
- Visual appraisal of uniformity of wool-pile fibre density
- Wool dye colour (specified by the Pantone Matching System)
- Wool dye fastness properties

The specifications for the leather are:

- Degree of tannage (as measured by hydrothermal shrinkage temperature)
  - \textbf{Regtemp}: minimum shrinkage temperature 100°C
  - \textbf{Hitemp}: minimum shrinkage temperature 110°C

- Maintenance of shrinkage temperature following washing and drying

  For both products, the Standard specifies that the shrinkage temperature shall not decrease by more than 5°C after five appropriate wash and dry cycles.

Some chemicals routinely used in laundries are detrimental to chrome tanned leather. The following chemicals should never be used in woolskin laundering:
- Enzymes, Phosphates, Peroxide, Alkalies, Bleach, Triethanolamine, Sequestering Agents

The standard also classifies products on the basis of size (area) and contains criteria for the manufacturer’s label’ which must be fixed to the back of the skin to establish compliance with AS4480.1
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