UC-eHealth-01 3D Hydrogel patch

12.11.2024

6G-Path

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Geriatrics Research

6G-PATH project has received funding from the Smart Networks and Services Joint Undertaking (SNS JU) under the European Union's Horizon Europe research and innovation programme under Grant Agreement No 101139172.

Background and Objective

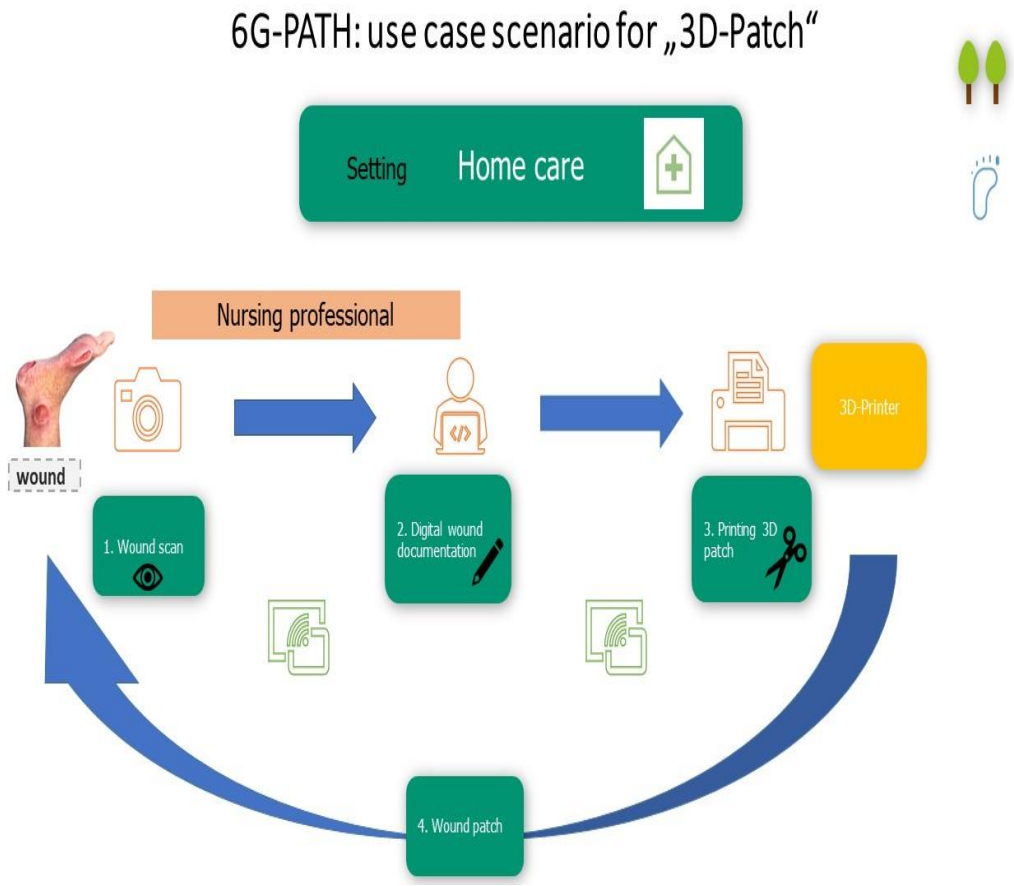
- Development of a chronic wound increases exponentially with age: prevalence of chronic wounds among 70 to 80-year-olds is 3%, among those over 90 it is already 11%.
- With evidence-based therapy, good results in healing, care and prevention can be achieved.
- Multiple studies shown that telemedicine helps wounds heal better and reduces the need for hospital visits or surgery (amputations).

Objective:

Provide a higher level of care for patients, particularly those with wounds especially elderly people in remote areas are particularly isolated from modern wound treatment.

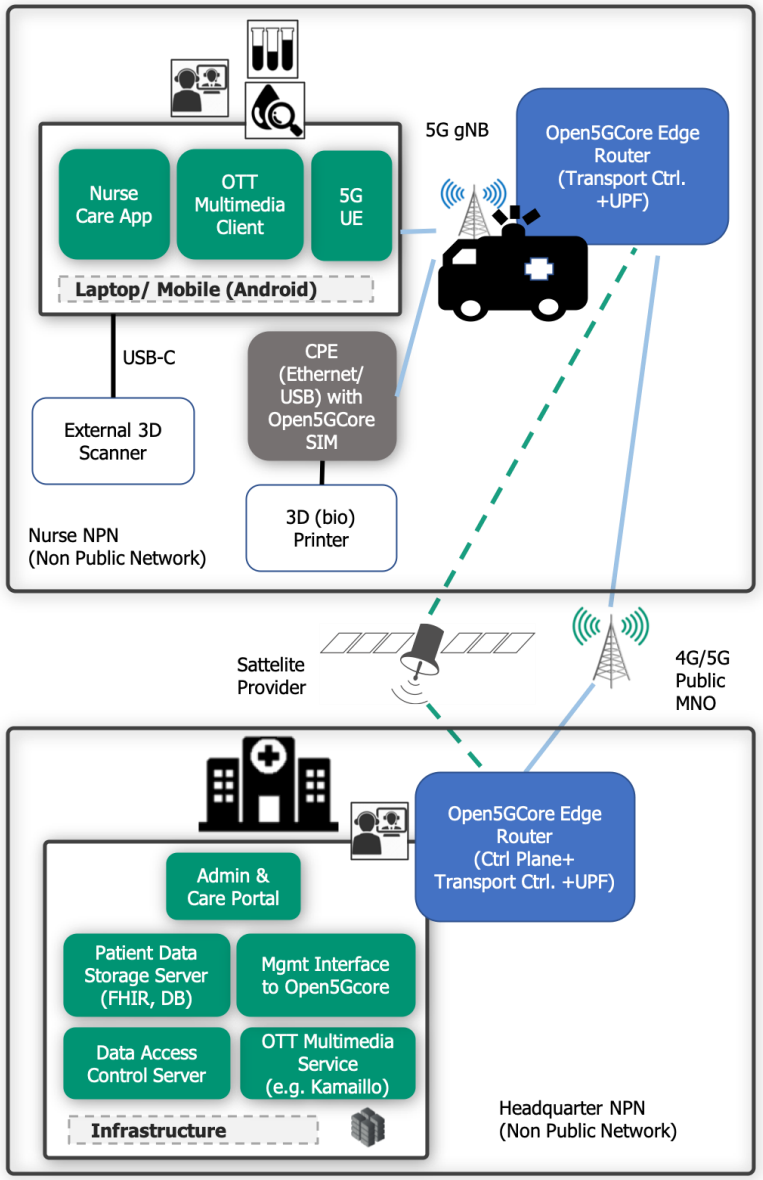
Pilot Description

- **Towards personalised wound dressing from the 3-D printer for chronic wound patients for remote areas**
  1. Special 3D Scanning camera/mobile App creates 3D modell of the wound.
  2. Additional information provided by nurses on site will be collected .
  3. Backend analysis of the the wound model, designs an individual dressing and transfer these featured data to…
  4. ..the bioprinter which is on site. This device produces an individual perfectly fitting wound dressing , e.g. from a hydrogel which can be applied by the nurse on site.



Utilization of 6G Advanced Features

- **Secure and Private Connectivity** with high Throuput and low Packet-loss
- Non-Public-Network with Open5GCore and off-the-shelf gNBs
- **Open5GCore** - Backhaul Management for Satellite and public Mobile Network Operator (MNO)
- **End-User Devices**:
  - 3D scan connected to smart phone
  - 3D printer connected via Customer Premises Equipment (CPE)



Validation plan

- **Laboratory Testing**:
  - The size of the wound dressing is measured to assess the suitability of the dressing for the scanned wound. In a laboratory setting, the sterility of the dressing is evaluated through the use of a Petri dish.
- **Usability Testing**:
  - Nurses are to be engaged nurses in usability testing to evaluate the solution's user interface, ease of use, and overall user experience.
- **KVI Testing**:
  - Different approaches of designs will address different KVI (Surveys, interview, expert panels, etc.)

Use Case KVIs description

KVI	Objective
Public health	Use the same devices and a single doctor in the hospital for a high number of distributed patients which do not leave their premises
Enhanced Care Quality	Increase the number of successfully treated wounds
Increasing quality of life	Decrease of visits to the doctor / hospital stays
Societal Upgrade	Use nomadic networks which can visit multiple patients in the same day
Societal Acceptability	Commodity services at patients' home
Sustainability	Use a single nurse's travel plan to cover multiple patients
Cost Reduction	Achieve less costs compared to conventional wound dressings

Challenges

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Clinical challenges:

- Data collection on site
- Change of established care procedures by applying telemedicine
- Education of different stakeholders (on site – telebase centre)

Technical challenges:

- Exact scan of wound
- Precise design of dressing
- Fast printing and sterilasation of dressing material
- Stable, fast and secure data transfer

Possibles Extension of the 5G/6G technology in healthcare

- **Using VR for education purposes.**

→ **Realistic simulations**:e.g. emergency procedures → Patient safety (Liu et al., 2023, Mithun Kumar, 2024)

→ **Enhanced Learning Outcomes:** can improve knowledge and practical skills (Chen et al., 2020, Plotzky et al., 2021)

→ **Development of Critical Skills**: develop critical thinking, decision-making, and communication skills (Kiegaldie and Shaw, 2023)

→ **Accessibility and Flexibility:** learning anytime (Kiegaldie and Shaw, 2023)

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