Implementation

Full realization of the potential of personalized medicine requires further investment and collaboration [6]:

01 Recognizing the **urgency** and **necessity** of personalized medicine and **molecular identification**

02 **Digitizing healthcare** and developing **single-cell omics** to investigate cells

03 Imbue **skills** and **principles** of into **existing healthcare systems** to exploit **scientific advancement** to better patient care

04 Using **biomarkers** to further **research and development** and small size trials

05 Forming professional **partnerships** between different **diagnostic** and **development** corporations and industries

06 **Educating sales teams** with patient **history**, diagnostic **treatment** methods, and **disease pathways**

07 **Post market surveillance** to better **focus** future **clinical trials** of pharmaceutical products

*"The **primary goal** and **benefit** of patient-centered care is to **improve individual health outcomes**, not just population health outcomes" [8]*

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PERSONALIZED MEDICINE

Individualized Care Pharmacogenetics

NAE Grand Challenge 5:
Engineering Better Medicines

Importance

The **potential** for personalized medicine to **tailor therapy** with the **best response** and **highest margin of safety** to better **individual** patient care and **outcomes** is significant. [6,7]

Using **pharmacogenetic/genomic analysis** techniques to divide patients into **groups** based on **genetic markers** that **predict disease progression**, in particular noting non-responsive and toxicity predictions, we hope to **reduce** frequency of adverse events from **5%** to around **2%.** [7]

"THE RIGHT DRUG, WITH THE RIGHT DOSE AT THE RIGHT TIME TO THE RIGHT PATIENT" [7]

Variable drug response is **multifactorial**, including age, sex, body weight, nutrition, organ function, infections, comedications and genetic factors. The study of **polymorphic metabolic enzymes, transporters and receptors** is another contributor to **targeting medicine** and **choosing appropriate drug targets.** [7]

Some Applications

Monoclonal Antibody (MAb) Therapies

Herceptin is useful in **20-30%** of patients with **breast cancer** and **elevated HER2 expression**, though patients with **mutated** HER2 tend to be **drug resistant**; molecular **characterization** of genetic and epigenetic factors can **stratify patients** for **optimal use.** [6]

Immunotherapy in Clinical Practice

Sipuleucel(Provenge) is used to **extract dendritic cells** for incubation and maturation in the **presence** of the **prostatic acid phosphatase** (PAP) enzyme, present on over **95%** of **prostate cancer** cells, so that when they are reintroduced into patient blood, they guide immune response to target and attack tumours. [1]

CRISPR-Cas9 Gene Editing

Ex-vivo modification of **oncogenes** could allow for the creation of treatments that take into account **unique tumor evolution pathways** for in a patient-specific way. This **genetic engineering** is advancing ang undergoing clinical trials. [2]