Clinical Context
Australia's Northern Territory presents a number of challenges to clinicians in the provision of health care, both with its geography and the challenges of disease. There are also indigenous health cultural differences. This is further complicated by significant workforce shortages with high levels of staff turnover and limited access to specialist services. In the Territory, the health service delivery model has evolved to rely heavily on onsite nursing staff and Aboriginal health workers with high levels of 'virtual' medical support by telephone, video and retrieval services.

Within Aboriginal communities there is a very high burden of disease and the age of onset for many of these conditions is much younger than the rest of Australia. In addition there is a high prevalence of multiple co-morbid disease which has contributed significantly to the disparity in life expectancy between Aboriginal and non-Aboriginal Australians.

Within the Remote Health sector, PACS and Communicare are the predominant primary clinical information systems (CIS) used to create plans of care in the delivery of health services to clients across community health centres. These clinical systems use internal care planning functionality, but are not supported by evidence based decision support, nor have any capacity to share these plans of care and their associated data between community health clinics in different locations. Further, any information held in these systems is also inaccessible to the acute care sector or Secondary Care clinicians who are providing the virtual support from a distance.

CareNet is a cloud based software portal and provides a centralised system for clinicians to use as a tool to analyse a patient's clinical data applying evidence-based best practice guidance via a clinical decision support inference engine. The system allows clinicians to use this guidance to build electronic Plans of Care (SmartPaths) customised to a client’s individual clinical requirements as an output.

Every patient in CareNet therefore has a Smart Path customised to their own specific clinical needs. This plan of care is the best practice care package and forms the basis of their ongoing clinical management, supporting the patient journey through the continuum of care.

SNOMED unifies disparate systems
CareNet extracts clinical information from PCBS and Communicare Clinical Information Systems (CIS) both these systems use ICD-2 PLUS coding systems. ICD-2 PLUS coding system is a primary care based coding system for understanding primary care encounters, processes of care and symptoms and problems. ICPC-2 PLUS is mapped to SNOMED to enable the rules engine to drive clinical decision support.

The patient object layer communicates with the different CIs and provides the unifying step to the OpenEHR data model. An example of the OpenEHR DOM is presented in Figure 2. The ICPC-2 PLUS codes are translated by the terminology service to SNOMED CT by one to one maps. An example of this is illustrated in Table 1, below.

Table 1. Terminology Service translating ICPC-2 PLUS codes to SNOMED CT

<table>
<thead>
<tr>
<th>SNOMED CT Code</th>
<th>SNOMED CT</th>
<th>ICPC-2 PLUS Code</th>
<th>ICPC-2 PLUS Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>W271014</td>
<td>Hospitalisation (Hospitalisation)</td>
<td>W271014</td>
<td>Hospitalisation</td>
<td></td>
</tr>
<tr>
<td>W710171</td>
<td>Antenatal care (Antenatal care)</td>
<td>W710171</td>
<td>Antenatal care</td>
<td></td>
</tr>
</tbody>
</table>

SmartPath care plans
The tiered architectural design provides separation of the guidance within the SmartPath care plans from all the other components within the system. SmartPath care plans are held within the rules engine and additional plans can be added and the complexity of the system supported. Conflicting recommendations are dealt with in a hierarchical prioritisation table. The SmartPath system allows the system to expand and cover more clinical scenarios without any additional programming.

The architectural design is clinical specialty independent and allows for the embedding of the technology stack into any health care scenario not just a maternal care.

In conclusion
We describe the CareNet system based on the PCBS CIS technology stack. The technology supports the delivery of best practice guidance to Aboriginal antenatal care in Northern Territory. The technology supports complex decision making for a mobile transitory workforce and population. SNOMED CT facilitates standardisation of meaning and consistency of patient data across disparate patient information record. It is the core ontology that enables the rules engine to drive clinical decision support.