Interoperability in the wild

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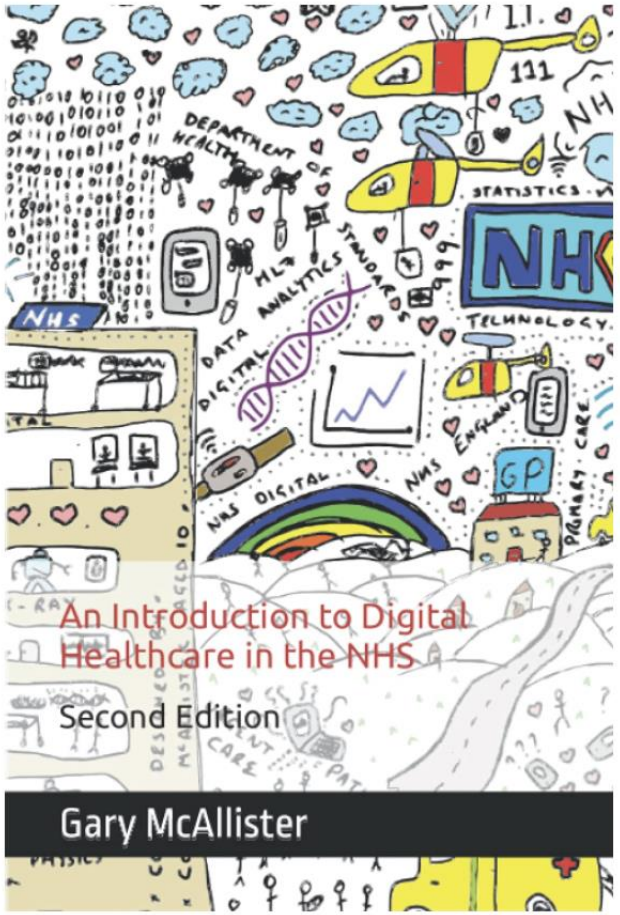
https://amzn.to/35SptY5



Firstly

It’s a jungle out there!

Secondly …. Standards (adoption)

What standards are we talking about?

- FHIR – Fast Healthcare Interoperability Resources – the new one!
- HL7v2 – Health Level 7 – the old one!
- OpenEHR – Framework for EHR development / ‘open’ data standards (the platform)
- IHE – Standards body for creating interoperability profiles

And these rely on other standards.

- HTTP(S) – (Secure) Hypertext Transfer Protocol
- TCP – Transport Communication Protocol
- SOAP – Simple Object Access Protocol

- Etc. etc.

Standards within standards within standards

- ICD10 – International Classification of Diseases
- SNOMED-CT – Systemized Nomenclature of Medicine
  - UTL – Unified Test List
- OPCS – Office of Population Censuses and Surveys

NHS Specific uses;

- CDS – Commissioning Data Set
- ECDS – Emergency Care Data Set
- The list goes on…..

So.. What is out there in the wild?

- There might be tears ….

Its not all rainbows and unicorns (RIO)

Address Details | Assessment Details | Care Package | Current Communication Needs | Contact Details | Demographics And Relationships | Social Care Forms | Safeguarding Details | Service User Details | Social Worker Details

Demographics And Relationships

Title	First Names	Last Name	Date of Birth	Gender	Ethnicity	First Language	Fluency in English	Religion	NHS Number	NHS Number Status	Marital Status
	Duncan	Kereva	28/02/1979	Male	White				9660979622	N	

Relationships

```
> <head> <META http-equiv="Content-Type" content="text/html; charset=UTF-8"> <style type="text/css">
{ font-size: 13px; font-family: 'Liberation Sans'; background-color: #f1f0ee; } ul#tabs {
style-type: none; margin: 20px 0 0 0; padding: 10px 0 0 0; background-color: #497BA1; height: 20px;
order-top-right-radius: 5px; border-top-right-radius: 5px; -ms-border-top-left-radius: 5px;
r-top-left-radius: 5px; } ul#tabs li { display: inline; float: left; } ul#tabs li a { color: #497BA1;
round-color: #d0e5f5; border: 1px solid #497BA1; border-bottom: none; padding: 0.7em 0.3em 0.38em 0.
text-decoration: none; font-weight: bold; -ms-border-top-right-radius: 5px; border-top-right-radius:
-ms-border-top-left-radius: 5px; border-top-left-radius: 5px; } ul#tabs li a:hover { background-color:
e5f5; color: #1d5987; } ul#tabs li a.selected { color: #e17009; background-color: #f5f8f9; font-wei
 padding: 0.7em 0.3em 0.38em 0.3em; } div.tabContent { border: 1px solid #a6c9e2; padding: 0.5em;
round-color: #FFFFFF; color: #000000; } div.tabContent.hide { display: none; } .hdiv { border: 1px
 #a6c9e2; margin-bottom: 20; -ms-border-top-right-radius: 5px; border-top-right-radius: 5px;
order-top-left-radius: 5px; border-top-left-radius: 5px; padding-bottom :0px } h4 { background-color:
7BA1; border: 1px solid #a6c9e2; color: #FFFFFF; padding: 6px; margin-top: 0;
order-top-right-radius: 5px; border-top-right-radius: 5px; -ms-border-top-left-radius: 5px;
r-top-left-radius: 5px; } h5 { background-color: #497BA1; border: 1px solid #a6c9e2; color: #FFFFFF
ng: 6px; margin-top: 0; -ms-border-top-right-radius: 5px; border-top-right-radius: 5px;
order-top-left-radius: 5px; border-top-left-radius: 5px; } table { width: 100%; font-size: 13px;
family: 'Liberation Sans'; padding: 0; border-spacing: 0; } table th { background-color: #d0e5f5;
: #497BA1; padding: 3px; text-align: left; font-weight: bold; border-left: 1px solid white; } tr:hove
kground-color: #fbec88; } td { border-bottom: 1px solid lightgray; padding: 2px; } </style>
e>Social Care Record</title> <script type="text/javascript"> var tabLinks = new Array(); var
ntDivs = new Array(); function init() { var tabListItems = document.getElementById('tabs').childNodes;
 var i = 0; i < tabListItems.length; i++ ) { if ( tabListItems[ (local var) tabLink: any r tabLink =
rstChildWithTagName( tabListItems[i], 'A' ); var id = getHash( tabLink.getAttribute('href') ); tabLinks
= tabLink; contentDivs[id] = document.getElementById( id ); } } var i = 0; for ( var id in tabLinks ) {
nks[id].onclick = showTab; tabLinks[id].onfocus = function() { this.blur() }; if ( i == 0 ) tabLinks[id]
sName = 'selected'; i++; } var i = 0; for ( var id in contentDivs ) { if ( i != 0 ) contentDivs[id].
Name = 'tabContent hide'; i++; } } function showTab() { var selectedId = getHash( this.getAttribute
f') ); for ( var id in contentDivs ) { if ( id == selectedId ) { tabLinks[id].className = 'selected';
ntDivs[id].className = 'tabContent'; } else { tabLinks[id].className = ''; contentDivs[id].className =
ontent hide'; } } return false; } function getFirstChildWithTagName( element, tagName ) { for ( var i =
< element.childNodes.length; i++ ) { if ( element.childNodes[i].nodeName == tagName ) return element.
Nodes[i]; } } function getHash( url ) { var hashPos = url.lastIndexOf ( '#' ); return url.substring(
os + 1 ); } </script> </head> <body onload="init()"> <ul id="tabs"> <li> <a href="#Address
ls">Address Details</a> </li> <li> <a href="#Assessment Details">Assessment Details</a> </li> <li> <a
"#Care Package">Care Package</a> </li> <li> <a href="#Current Communication Needs">Current
nication Needs</a> </li> <li> <a href="#Contact Details">Contact Details</a> </li> <li> <a
"#Demographics And Relationships">Demographics And Relationships</a> </li> <li> <a href="#Social Care
```

So.. What does this mean??

- Interoperability is a continually evolving feast.

- Even when suppliers implement the ‘standards’ they are not always supplied consistently.

- There is limited adoption and even nationally we are in a period of flux:

    - National Record Locator has implemented FHIR but is only a write-based service – does not support reading from other HIEs – has unclear SLAs etc. Not necessarily a standards issue but does demonstrate that architectural management is critical.

    - GPConnect – has been slow to materialise because the standards needed ratification and priorities are not always on interoperability on the supply side. The progress and adoption has been very slow but beginning to materialise.

- ***There is limited evidence of end to end interoperability workflows with data-exchanging bi-directionally to support seamless information flows. This is the holy grail – reducing transcription etc…***

So lets look at some more examples.

More examples (from London HIE).

GraphNet = SOAP

```
HTTP/1.1 200 OK
Cache-Control: private
Content-Type: text/xml; charset=utf-8
Server: Microsoft-IIS/8.5
Set-Cookie: ASP.NET_SessionId=550cmej1ack0yijt2h3sppk0; path=/; secure;
HttpOnly; SameSite=Lax
X-AspNet-Version: 4.0.30319
X-Powered-By: ASP.NET
Date: Tue, 08 Mar 2022 14:09:08 GMT
Connection: close
Content-Length: 887

<s:Envelope xmlns:s="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:u="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-
utility-1.0.xsd"><s:Header><ActivityId CorrelationId="84863875-
aaf7-4a92-8f20-67fc0238539d" xmlns="http://schemas.microsoft.com/2004/09/
ServiceModel/Diagnostics">00000000-0000-0000-0000-000000000000</
ActivityId><o:Security s:mustUnderstand="1" xmlns:o="http://docs.oasis-
open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd"><u:Timestamp
u:Id="_0"><u:Created>2022-03-08T14:09:08.960Z</
u:Created><u:Expires>2022-03-08T14:14:08.960Z</u:Expires></u:Timestamp></
o:Security></s:Header><s:Body><GetPatientNumberFromNhsNumberResponse
xmlns="http://www.graphnethealth.com/gateway/framework/
2010/11"><GetPatientNumberFromNhsNumberResult>11368972</
GetPatientNumberFromNhsNumberResult></GetPatientNumberFromNhsNumberResponse></
s:Body></s:Envelope>
```

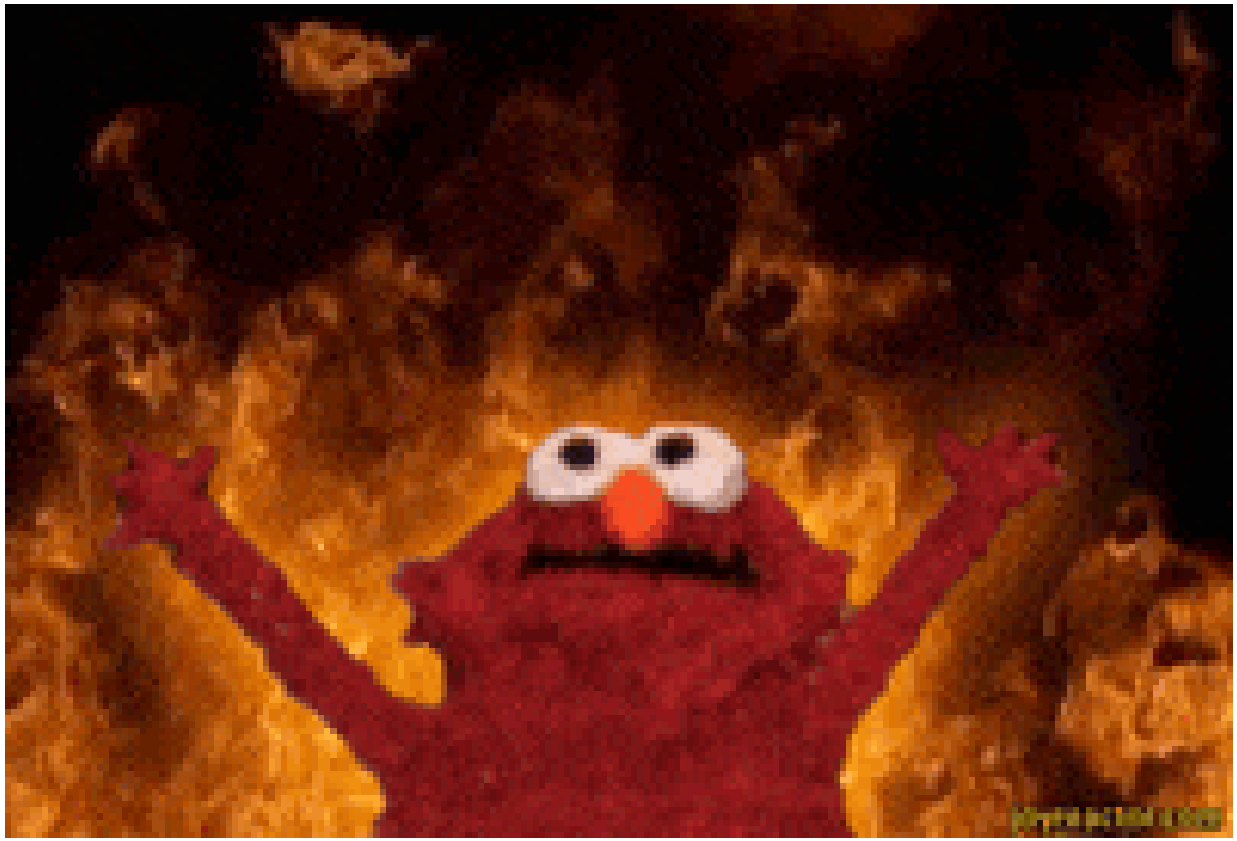
NOT FHIR

More examples (from London HIE).

Rio = HTML

```
<?xml version="1.0" encoding="UTF-8"?>
<s:Envelope xmlns:s="http://schemas.xmlsoap.org/soap/envelope/">
    <s:Body>
        <PatientSummaryViewGetResponse xmlns="http://cse-healthcare.com/API/1.0">
            <PatientSummaryViewGetResult xmlns:i="http://www.w3.org/2001/XMLSchema-instance">
                <AuthenticationToken>92453c0b-9372-455d-9d0d-43ef1f381955</AuthenticationToken>
                <Response xmlns:a="http://schemas.microsoft.com/2003/10/Serialization/Arrays">
                    <a:KeyValueOfstringstring>
                        <a:Key>PatientSummaryReport</a:Key>
                        <a:Value>&lt;html&gt;&#13;
&lt;head&gt;&#13;
  &lt;META http-equiv="Content-Type" content="text/html; charset=utf-8"&gt;&#13;
  &lt;meta charset="utf-8"&gt;&#13;
  &lt;style type="text/css"&gt;
        @media screen {
        DIV#report {
        overflow: auto;
        height: 100%;
        }
        button {width: 80px;}
        }

        tfoot { display: table-footer-group; }

        .ReportTitle {font-family: 'Trebuchet MS'; font-weight: bolder; font-size: 16px; color: #165B80; text-align: center;}

        div.textFrame {
        background-color: WhiteSmoke;
        border: 1px solid #cccccc;
        margin-top: 2px;
        }

        thead {display: table-header-group; }
        td.VerticalDivider {border-top: solid black 1px; border-left: none; border-right: none; border-bottom: none; padding: 0px
        tr.NoData {color: Red; font-family: 'Trebuchet MS'; font-weight: bolder; font-size: 12px; border: solid #165B80 1px; text

        table.ReportTable {border-collapse: collapse;}
        table.ReportTable td {border: none;}
```

NOT FHIR



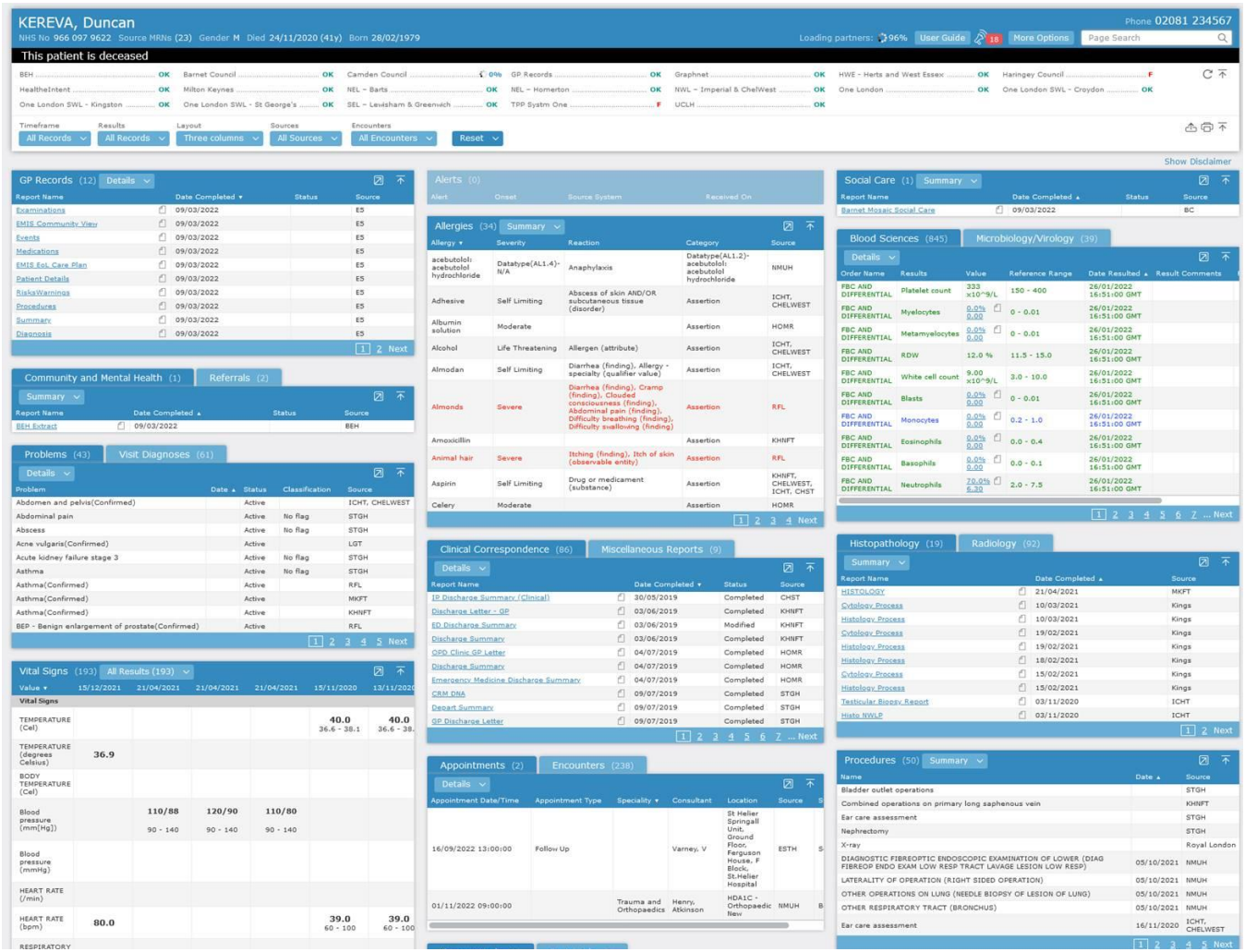
More examples (from London HIE).

Epic = IHE XCA – Cross Community Access (SOAP)

```
<?xml version="1.0" encoding="UTF-8"?>
<s:Envelope xmlns:s="http://www.w3.org/2003/05/soap-envelope" xmlns:a="http://www.w3.org/2005/08/addressing">
  <s:Header>
    <a:Action s:mustUnderstand="1">urn:ihe:iti:2007:CrossGatewayQueryResponse</a:Action>
    <a:RelatesTo>a13a73c6-f595-441c-adb0-4e45b3b9698a</a:RelatesTo>
  </s:Header>
  <s:Body xmlns:xsd="http://www.w3.org/2001/XMLSchema" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
    <AdhocQueryResponse xmlns="urn:oasis:names:tc:ebxml-regrep:xsd:query:3.0" status="urn:oasis:names:tc:ebxml-regrep:ResponseStatusType:Success">
      <RegistryObjectList xmlns="urn:oasis:names:tc:ebxml-regrep:xsd:rim:3.0">
        <ExtrinsicObject home="urn:oid:1.2.840.114350.1.13.525.3.7.3.688884.100" id="urn:uuid:9c105138-985d-11eb-980f-000c29cbaf7b" isOpaque="false"
          <Slot name="creationTime">
            <ValueList>
              <Value>20210408112859</Value>
            </ValueList>
          </Slot>
          <Slot name="hash">
            <ValueList>
              <Value>-1</Value>
            </ValueList>
          </Slot>
          <Slot name="languageCode">
            <ValueList>
              <Value>en-US</Value>
            </ValueList>
          </Slot>
          <Slot name="repositoryUniqueId">
            <ValueList>
              <Value>1.2.840.114350.1.13.525.3.7.3.688884.100</Value>
            </ValueList>
          </Slot>
          <Slot name="size">
            <ValueList>
              <Value>-1</Value>
            </ValueList>
          </Slot>
```

NOT FHIR

But is very useful anyhow…

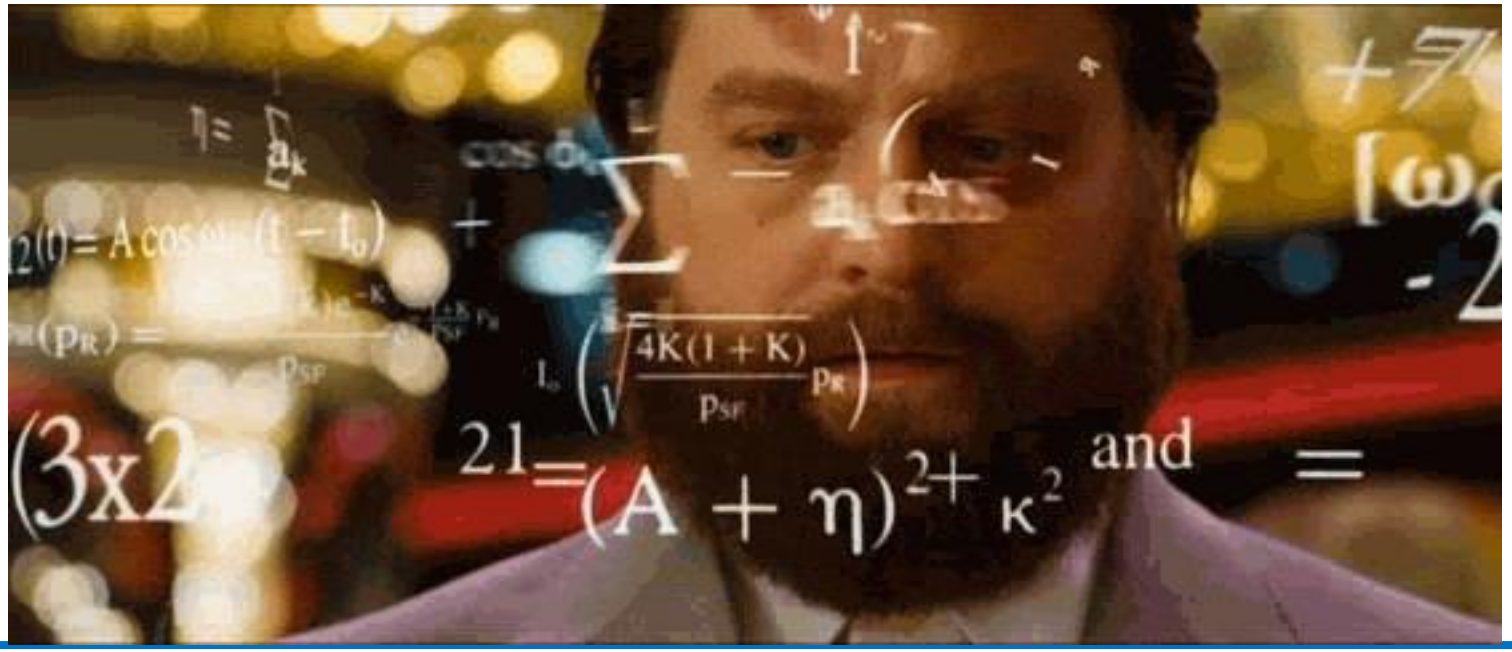


This is not to say these vendors don't have FHIR

- FHIR is relatively new as we know – and will take time to embed and adopt
- The FHIR standard is still maturing / evolving so will take time to stabilise for all clinical use cases.
- Most have or are working towards FHIR adoption but progress is really slow….

So what about this … Open EHR thing??

- Is an ISO standard for designing, building open Electronic Health Record systems.
- Build on architypes and an Clinical Data Repository.
- Its good, but not perfect – but does enforce interop as an architectural discipline.



Open EHR

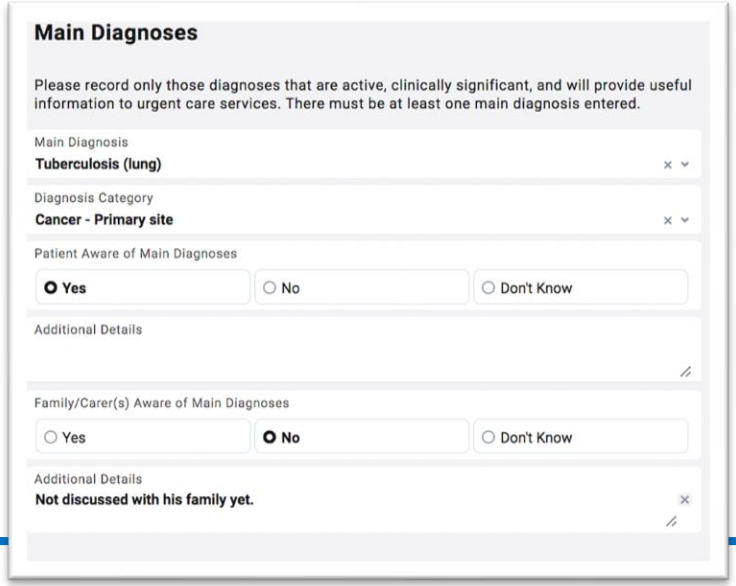
- So what does it look like under the hood?
- There are other flavours of CDR

Not FHIR

Benefits of OpenEHR

- Data is well-designed and curated by clinical communities, enforcing high fidelity capture of information.
- As architypes are built by communities there is no ‘closed’ solution.
- Open EHR platforms are ‘interoperable by design’ as they meet the OpenEHR specification which includes APIs etc.
- All specifications are open etc. etc. so limited vendor lock-in.

BUT…



Its not FHIR

So in summary…

- There is no perfect answer at the moment when it comes to interoperability.
- Even the great FHIR over HTTP(S) has limitations, requiring architectural considerations for event driven workflows (FHIR-Cast).
- Be patient as things mature in the industry but we need to drive suppliers to adopt the appropriate standards.
- Everything is version controlled so can and will change over-time.

- ***Focus on the goal of the interoperability need rather than the technology because nothing is perfect atm.***
- *And just in case you wondered….*

This is what some FHIR looks like - JSON ☺


```
{
  "resourceType": "Patient",
  "id": "example",
  "text": {
    "status": "generated",
    "div": "<div xmlns=\"http://www.w3.org/1999/xhtml\">\n\t\t\t<table>\n\t\t\t\t<tbody>\n\t\t\t
\t\t<tr>\n\t\t\t\t\t\t<td>Name</td>\n\t\t\t\t\t\t<td>Peter James \n              <b>Chalmers</b>
(&quot;Jim&quot;)\n            </td>\n\t\t\t\t\t</tr>\n\t\t\t\t\t<tr>\n\t\t\t\t\t\t<td>Address</
td>\n\t\t\t\t\t\t<td>534 Erewhon, Pleasantville, Vic, 3999</td>\n\t\t\t\t\t</tr>\n\t\t\t\t<tr>
\n\t\t\t\t\t\t<td>Contacts</td>\n\t\t\t\t\t\t<td>Home: unknown. Work: (03) 5555 6473</td>\n\t\t
\t\t\t</tr>\n\t\t\t\t<tr>\n\t\t\t\t\t\t<td>Id</td>\n\t\t\t\t\t\t<td>MRN: 12345 (Acme Healthcar
e)</td>\n\t\t\t\t</tr>\n\t\t\t</tbody>\n\t\t\t</table>\n\t\t</div>"
  },
  "identifier": [
    {
      "use": "usual",
      "type": {
        "coding": [
          {
            "system": "http://terminology.hl7.org/CodeSystem/v2-0203",
            "code": "MR"
          }
        ]
      },
      "system": "urn:oid:1.2.36.146.595.217.0.1",
      "value": "12345",
      "period": {
        "start": "2001-05-06"
      },
      "assigner": {
        "display": "Acme Healthcare"
      }
    }
  ],
```

Thanks for listening.