FHIR® Webinar
FHIR Search
November 03, 2021
Agenda & Structure

1. FHIR resources, Search basics
   - GET vs Search
   - GET vs POST
   - Search response – content and status
     - Pagination, _elements, _summary, ...

2. Search parameters
   - Search parameters basics
   - Special: _text, _list, ...

3. Advanced search
   - Chaining, composite
   - GraphQL

4. Using and specifying Search
   - Design considerations
   - Adding SearchParameters

5. Practical usage
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  • All diagrams, except those that state otherwise, are original materials or taken from the FHIR website and support materials; all screenshots are from the FHIR website

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Goals

1. Understand/recall the basics of FHIR® search: How / When to use it, what to expect and require as a response. Pagination, response formats...

2. Understand FHIR® Search parameters – how to find which ones are accepted, special search parameters, how to use them, how to add new search parameters

3. Understand advanced searches – chained, composite...

4. Be able to issue these searches against your own server

5. Understand some of the design and implementation aspects of Search
Practicing

• If you want to practice these examples, use
  • Any of the reference servers: hapi.fhir.org/r4, test.fhir.org/r4
  • Our collection with these examples: https://github.com/openhie/FHIRexamples/blob/main/search/search.http
    • Requires VSCode
FHIR Resources, REST
Search in FHIR

- FHIR® resources and profiles
- REST API
- Search API

Profiling, Searching are done technically – and FHIR has a language for that
FHIR Search
FHIR Search

- Search works as a filter – what data to retrieve
- RESTful search can be done with GET or POST
- Each system can configure its search behaviour
- Individual search operations can be parametrized – e.g. to include additional resources or limit the data
Anatomy – search request

GET  [base]/[type]?parametername=value&...

POST  [base]/[type]/_search

{[parameters]}
FHIR Search

- GET resource

Search works as a filter:
- GET /Patient – all patients
- GET /Patient/180252 – is NOT a search
- GET /Patient?_id=180252 – only the Patient resource with that ID
- GET /Patient?identifier=http://ssn.country.gov/ssn|0000-000-0000
- GET /Patient?birthdate=lt2010-11-03

- Search – always returns a Bundle

- Resources can be searched by using their search parameters
- A server can be searched across resource types

https://www.hl7.org/fhir/search.html
GET and POST search

GET {{host}}/Patient?_id=1545788
  • Search parameters are in the URL
  • May have some security implications

POST {{host}}/Patient/_search HTTP/1.1
Content-Type: application/x-www-form-urlencoded
_id=2081525
  • Search parameters are not in the URL, but in the body
  • Advantage: No URL size limitation
Search parameters

• Resource-specific search parameters e.g. [http://hl7.org/fhir/patient.html#search](http://hl7.org/fhir/patient.html#search)

<table>
<thead>
<tr>
<th>Search Parameter Types</th>
<th>Parameters for all resources</th>
<th>Search result parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>_id, _lastUpdated, _tag</td>
<td>_sort, _count, _include, _reinclude, _summary</td>
</tr>
<tr>
<td>Date/DateTime</td>
<td>_profile, _security, _text, _content, _list, _has, _type</td>
<td></td>
</tr>
<tr>
<td>String</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Token</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reference</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Composite</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quantity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>URI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Special</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In addition, there is a special search parameters _query_ and _filter_ that allow for an alternative method of searching, and the parameters _format_ and _pretty_ defined for all interactions.
All searches use the predefined parameters

• Any resource can be searched by ‘_id’, ‘_type’,...

• Patient – searchable on ‘status’, ‘name’...

• Patient – NOT searchable on maritalStatus
Response parameters

• Format
  • XML / json
    • _format=

• Content
  • Only Summary elements (show in FHIR spec)
  • Specific elements using _elements
Result parameters

• Sort: add one or more parameters for sorting
  • prefixed by a – for descending order

• Search pagination: ‘_count’ defines how many results to obtain
  • May be overridden by server limits
Text search

• Some servers support free text search

• Search for “John Mark” near “Gliclazide”
Search resources in a List

- Get all medication statements from the list that has been curated
References, chaining and reverse chaining

• References – Search for resources that reference a given resource
  • E.g. all Observations for a given patient
  • Logical References – using identifiers instead of id

• Reverse Chaining – Get all patients that have a MedRequest of a given type

• Include:
  • Get all MedRequests, include reference Patients
  • Get a given Patient, include also the Observations that reference the Patient
Search parameters
Search parameters

In addition, there is a special search parameters _query and _filter that allow for an alternative method of searching, and the parameters _format and _pretty defined for all interactions.

See the Profes & Extensions and the alternate definitions: Mbox Definition XML | JSON | ProfileDefinition XML | ProfileDefinition JSON | See the extensions & the dependency analysis.

8.4.4.1 Terminology Bindings

8.4.5 Notes:
- The practitioners Qualifications are acquired by the practitioner independent of any organization or role, and do not imply that they are allowed/authorised to perform roles relevant to the qualification of any specific organization (or specific)

8.4.6 Search Parameters

Search parameters for this resource. The common parameters also apply. See the extensions & the dependency analysis.
Search expressions

- Tokens
- Operators
Advanced search
Advanced Search

- Composite
- GraphQL
Using and specifying FHIR search
Situation: Levels / types of standards

https://commons.wikimedia.org/wiki/File:Osi-model-jb.svg

Design considerations

• Privacy, behaviour

• Development:
  • Try ensure you have a server with your reference content for testing
  • Define the search possibilities. Not all servers support _filter, but when they do…
Custom Search Parameters

• What if we need to add a new search parameter- e.g. patient.maritalstatus ?

• What if we make an extension and want that to be searchable?

• http://hl7.org/fhir/searchparameter.html
{
  "resourceType": "SearchParameter",
  "id": "patient-extensions-Patient-mothersMaidenName",
  "url": "http://hl7.org/fhir/SearchParameter/patient-extensions-Patient-mothersMaidenName",
  "version": "4.0.1",
  "name": "mothersMaidenName",
  "status": "draft",
  "experimental": true,
  "description": "Search based on patient's mother's maiden name",
  "code": "mothersMaidenName",
  "base": [
    "Patient"
  ],
  "type": "string",
  "expression": "Patient.extension('http://hl7.org/fhir/StructureDefinition/patient-extensions-Patient-mothersMaidenName')",
  "xpathUsage": "normal"
}
Adding SearchParameters

Additional notes, Q&A
Final Questions and Answers

• Has this answered your questions?
• Any challenges you expect?
• How do you expect to use Search?
Get in touch, be active

- Check with others (at chat.fhir.org or community.fhir.org)
- Create (or ask someone to create) a change request
- Join a FHIR® event like DevDays (devdays.com), discuss
- Join a FHIR® connectathon, test and provide feedback
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