

```
chain_of(
  with_elements(load_postgres_table(("public", "patient"), ["id"], [Int32])),
  flatten())
```



```
chain_of(with_elements(load_postgres_table(("public", "patient"), ["id"], [Int32])),
  flatten(),
  with_elements(
    chain_of(
      load_postgres_table(("public", "patient"), ["mrn"], [String], ["id"]),
      block_cardinality(x1to1))),
  flatten()),
  with_elements(
    chain_of(
      output(),
      column(1))))
```









The diagram illustrates the mapping of a query plan to a typed relational algebra. The left side shows the query plan, and the right side shows the typed relational algebra. Dotted arrows indicate the mapping between the two.

**Query Plan (Left):**

- flatten()** (green box) maps to **BlockOf x0toN** (teal oval).
- column(1)** (green box) maps to **BlockOf x0toN** (teal oval).
- output()** (green box) maps to **BlockOf x0toN** (teal oval).
- cardinality(x1to1)** (green box) maps to **BlockOf x1to1** (teal oval).
- load\_table("patient", ["id"]) SELECT id FROM patient** (green box) maps to **BlockOf x0toN** (teal oval).
- load\_table("patient", ["min", "id"]) SELECT min FROM patient WHERE id = ?** (green box) maps to **BlockOf x0toN** (teal oval).
- head** (yellow box) maps to **EntityShape "patient"** (teal oval).
- 1** (yellow box) maps to **TupleOf** (teal oval).

**Typed Relational Algebra (Right):**

- BlockOf x1to1** (teal oval) maps to **EntityShape DATABASE** (teal oval).
- BlockOf x0toN** (teal oval) maps to **TupleOf** (teal oval).
- EntityShape "patient"** (teal oval) maps to **TupleOf** (teal oval).
- TupleOf** (teal oval) maps to **Int32** (grey oval).
- BlockOf x0toN** (teal oval) maps to **EntityShape "patient"** (teal oval).
- EntityShape "patient"** (teal oval) maps to **TupleOf** (teal oval).
- TupleOf** (teal oval) maps to **Int32** (grey oval).
- BlockOf x0toN** (teal oval) maps to **EntityShape "patient"** (teal oval).
- EntityShape "patient"** (teal oval) maps to **TupleOf** (teal oval).
- TupleOf** (teal oval) maps to **String** (grey oval).
- BlockOf x0toN** (teal oval) maps to **BlockOf x1to1** (teal oval).
- BlockOf x1to1** (teal oval) maps to **BlockOf x0toN** (teal oval).
- BlockOf x0toN** (teal oval) maps to **BlockOf x0toN** (teal oval).
- BlockOf x1to1** (teal oval) maps to **BlockOf x0toN** (teal oval).
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- BlockOf x0toN** (teal oval) maps to **BlockOf x0toN** (teal oval).
- EntityShape "patient"** (teal oval) maps to **EntityShape "patient"** (teal oval).
- TupleOf** (teal oval) maps to **String** (grey oval).
- TupleOf** (teal oval) maps to **String** (grey oval).
- TupleOf** (teal oval) maps to **String** (grey oval).
- BlockOf x0toN** (teal oval) maps to **String** (grey oval).

















