Automated Immunisation Assessments

Data quality before and after automation

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Overview

- Problem for the SIEM team
- Collaborative approach taken to resolve
- Results of Automation
- Final Thoughts

Australian Government
Department of Health, Disability and Ageing

Australian **Immunisation** Handbook

Occupation	Vaccine
All health care workers Includes all workers and students directly involved in patient care or the handling of human tissue, blood or body fluids	• Hepatitis B • Influenza • MMR (if non-immune) ** • Pertussis (dTpa) • Varicella (if non-immune)

Problem

SIEM Team Requirements

- Staff Immunisation and Exposure Management Team
- Immunisation status of Alfred Health workforce, including newly onboarded staff
- 13,000 staff across 3 campuses
  - Alfred Hospital
  - Caulfield Hospital
  - Sandringham Hospital
- ~70,000 data points
- <u>No single source of truth</u>

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Immunisation assessments are a complex set of rules

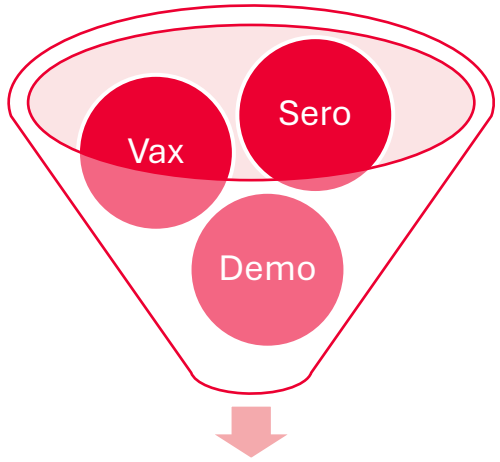
- Disease status of staff vaccination is a complex but logical (usually sequential) mix of data points
  e.g. MMR

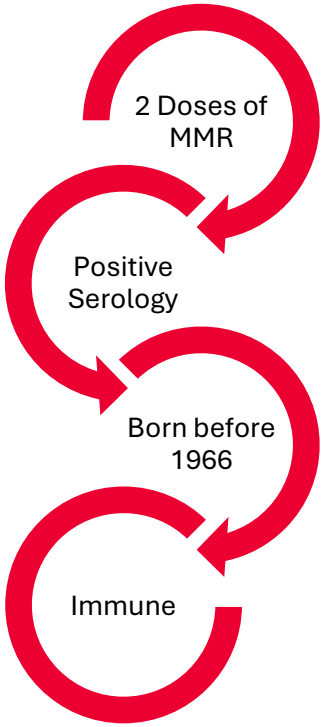
- What data points do we need? Demographics, Serology, Vaccines?

- What unrealized preferences do we have? e.g. MMR

- How do we translate this for the computer?

  ➢ Epidemiological Data Management Service (EDMS)





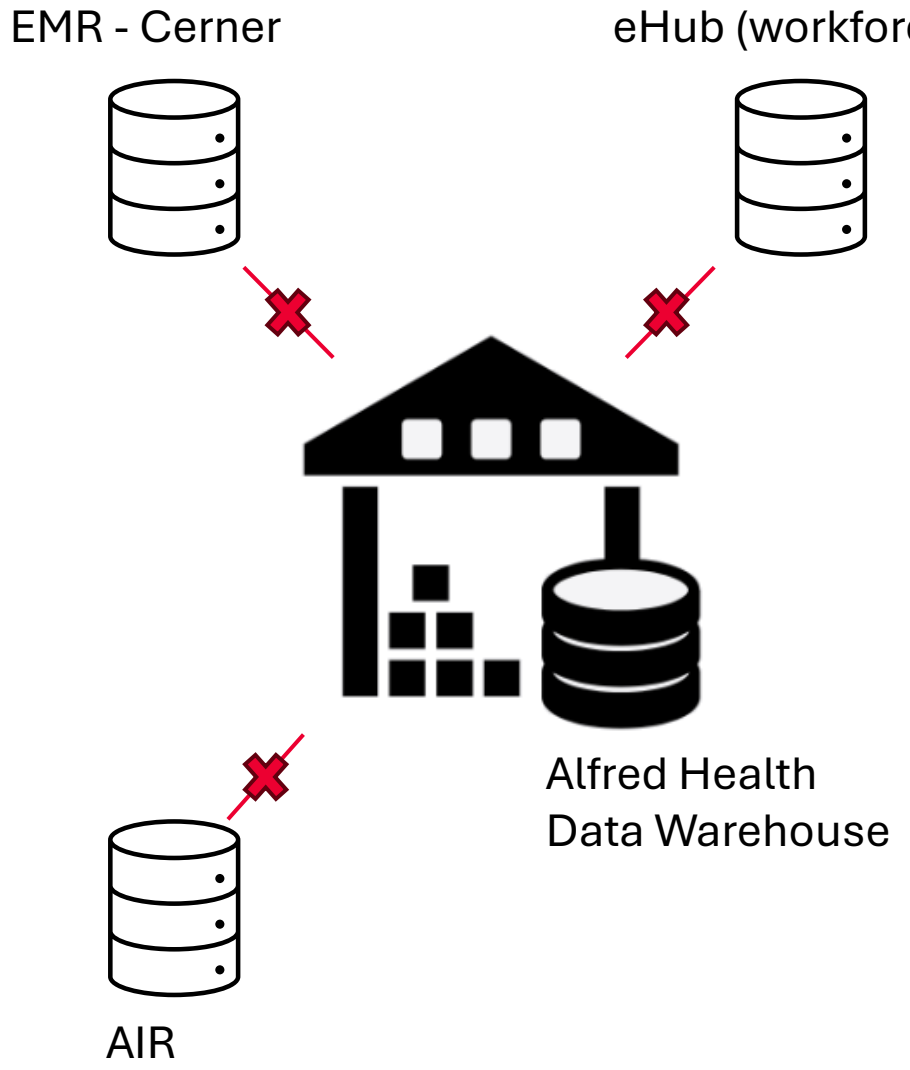
The Data Infrastructure at Alfred Health

Several Stores for Immunisation Data

- EMR (Cerner)
- eHub (workforce data)
- Australian Immunisation Register information
- Alfred Health Data Warehouse

Interactions between Stores

- There were **no** interactions between datasets
- SIEM nurses had to manually update eHub / check Cerner



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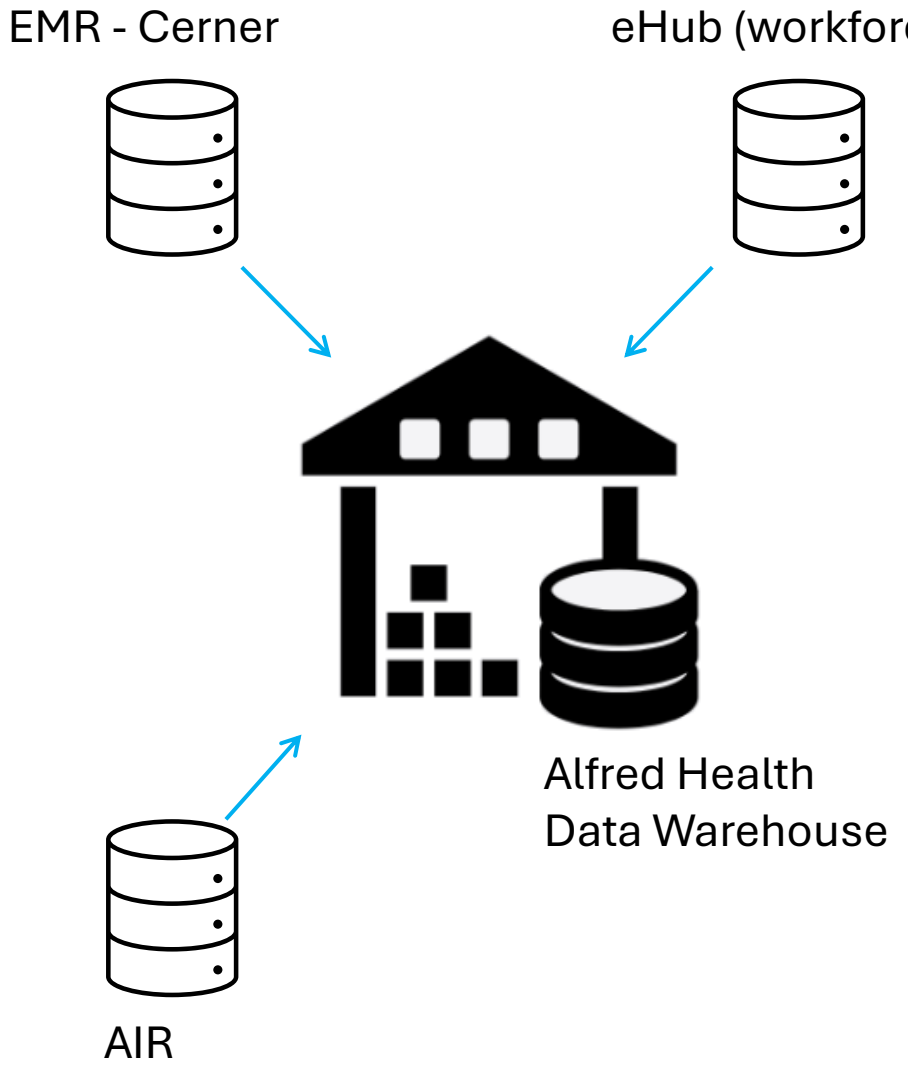

➢ **How to integrate systems?**

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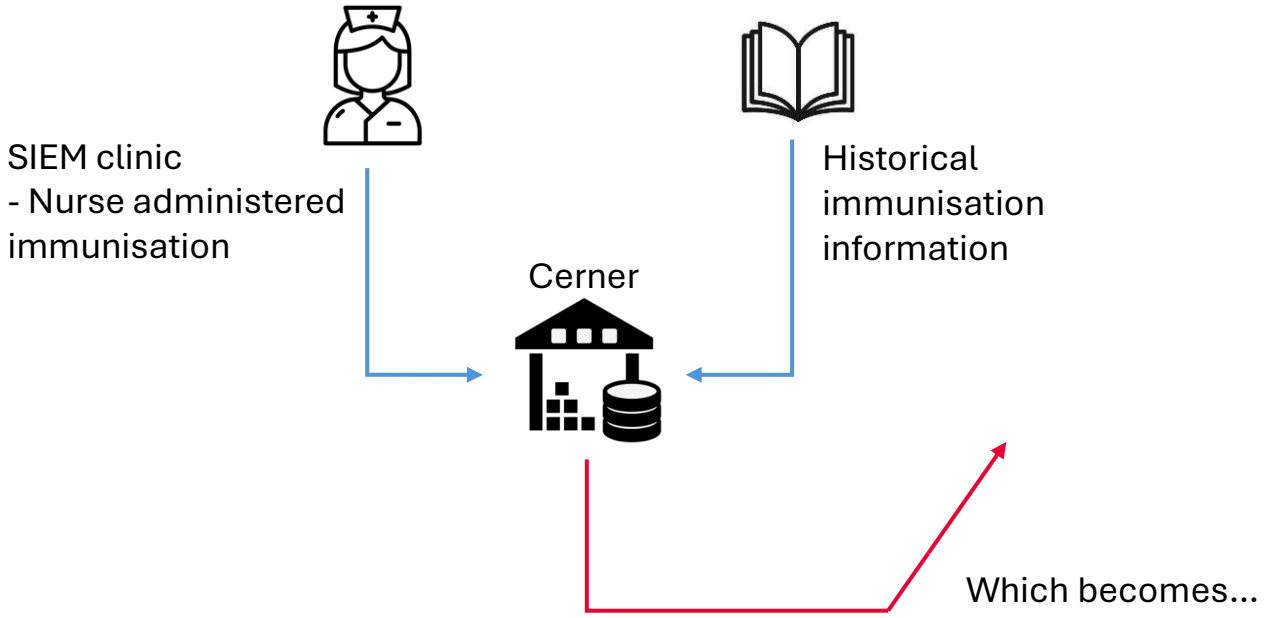
Approach

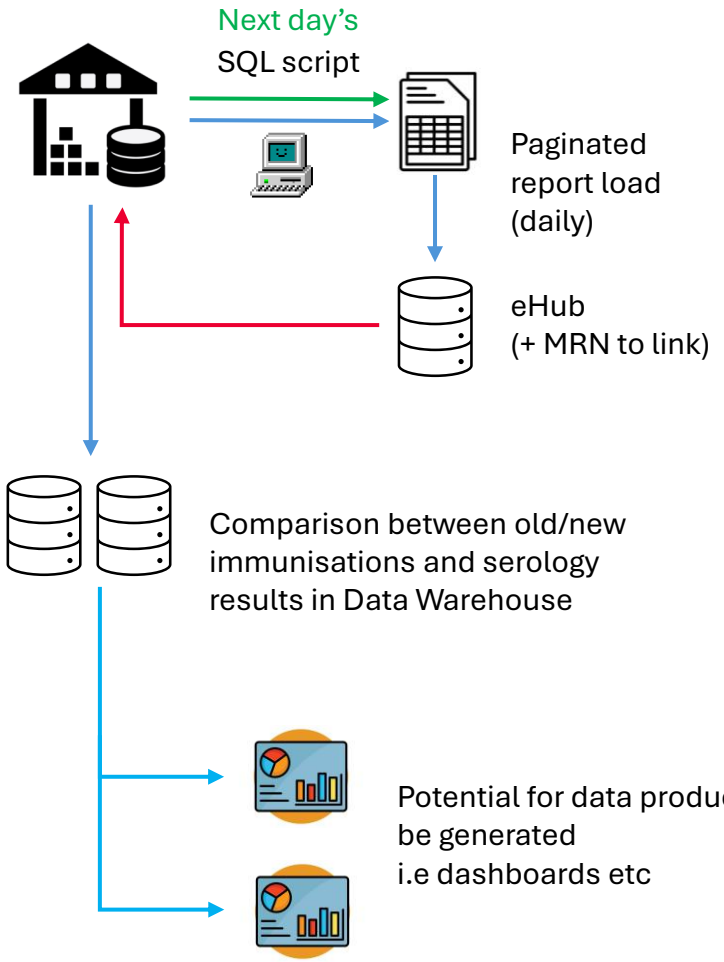
Need a single source of truth

Designated as the EMR

- Cerner became the focal point for data entry
- Allowed SIEM nurses to enter data in one place with flow on to other stores of information
- Ensured ability to continually correct information where needed

Workflow Initiation





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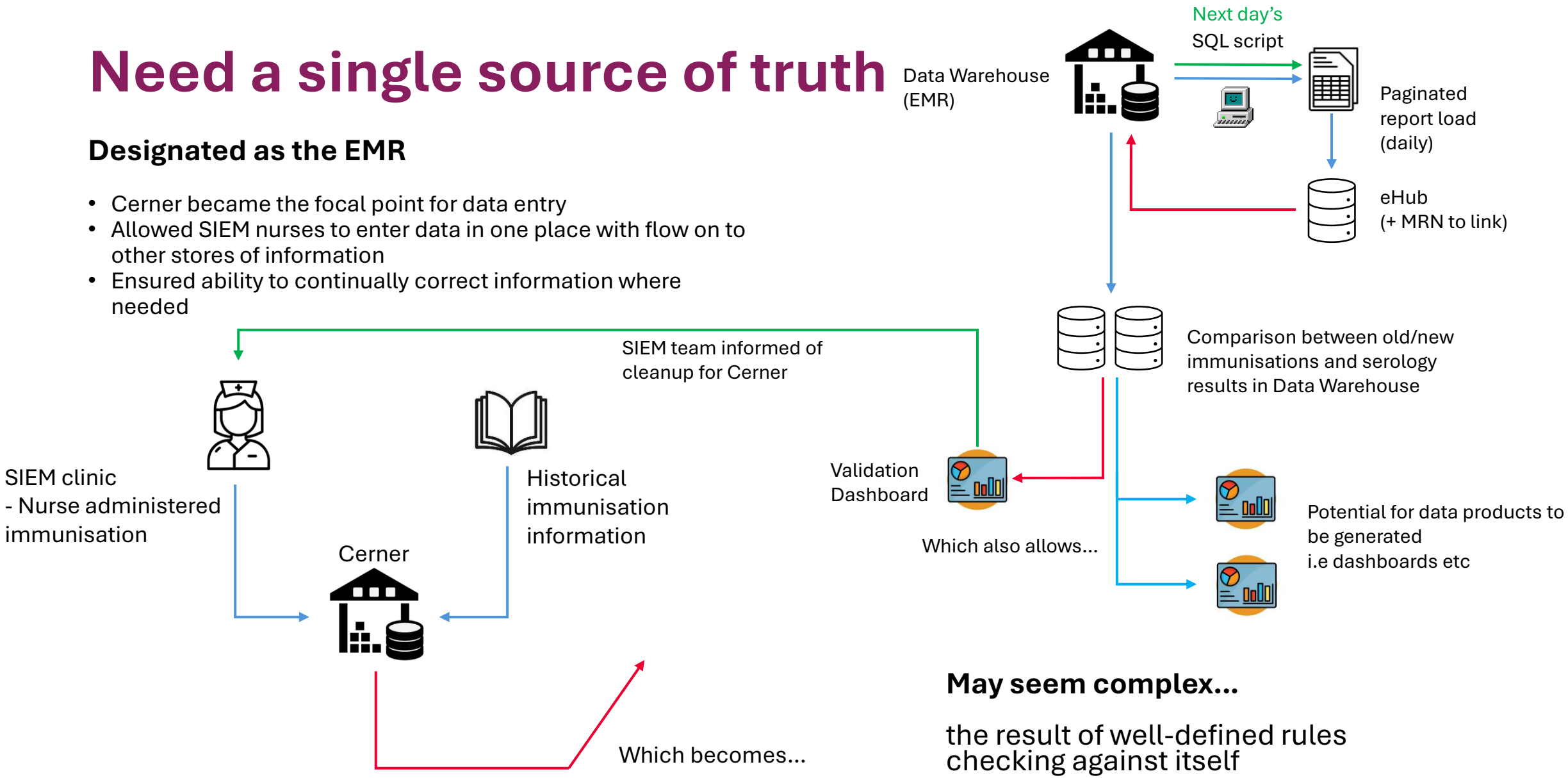

May seem complex...

the result of well-defined rules checking against itself

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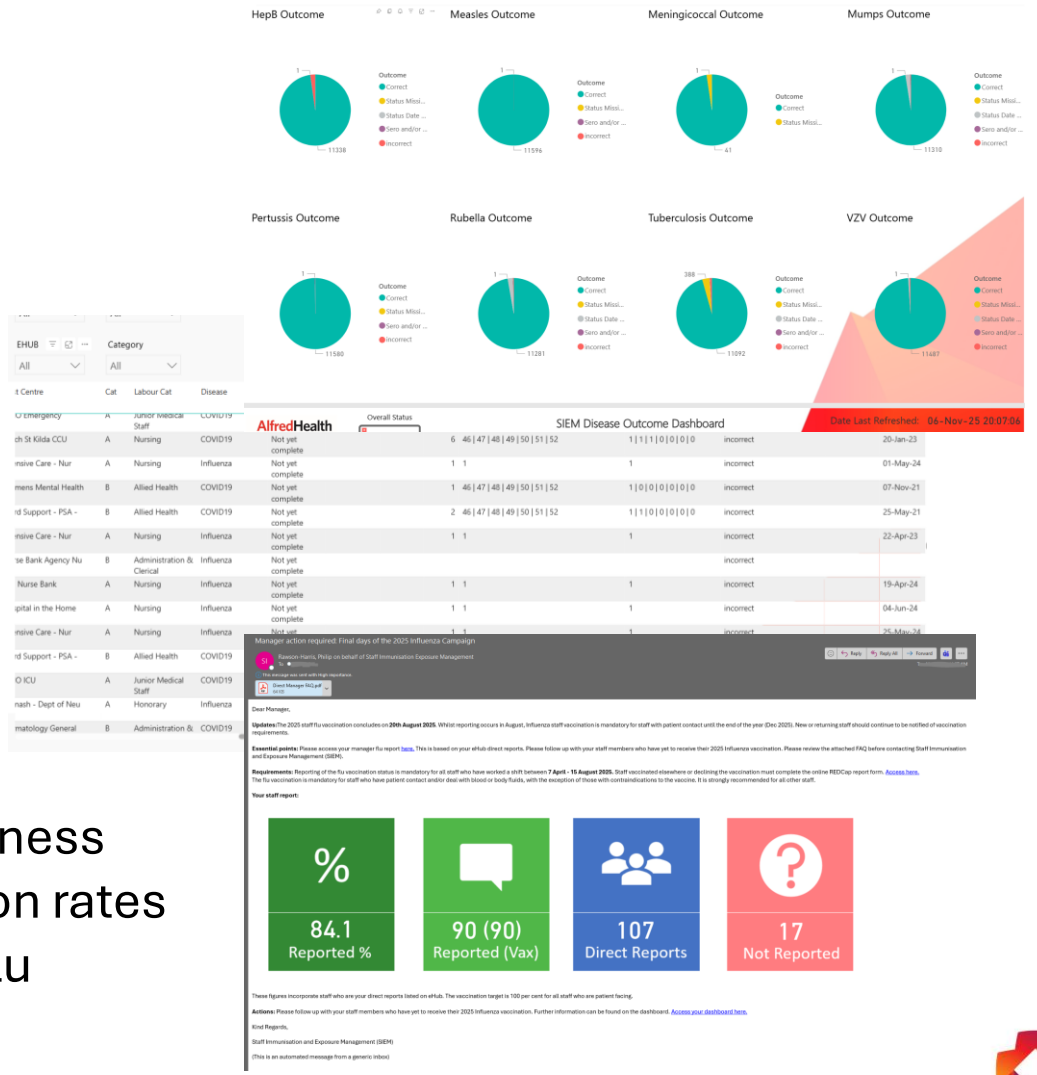
A Data Ecosystem: beyond automation

Process Outcomes

- SIEM nurses entering data in one place
  - reducing complexity and time
- Unified all health information into the EMR and Data Warehouse
  - Able to compare information across systems

Opportunity Outcomes

- A single, up-to-date store of immunisation information:
  - Validation dashboards for data quality and completeness
  - Performance dashboards of overall staff immunisation rates
  - Automation of annual immunisation campaigns i.e Flu



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Complex Rules: Successive improvements

- Incremental improvements starting with the broadest rules
- 2 x MMR then immune
- Born before 1966 = Age immune
- VZV vaccine x 3 then immune

```
--- order is important otherwise things will be mislabelled. case statements are first rule first labelled.
--missing rules
Case when  status is null then 'Status Missing'
    when es.SerologyLabel is null and vax_keylist is null and Status not in ('age immune','not yet complete') then 'Sero and/or Vax Data Missing'
    when status is not null and ei.RecordDate = '1900-01-01' and status <> 'not yet complete'  then 'Status Date Missing'
    when status = 'Declined' and #base.Disease <> 'COVID19' then 'correct'
-- Vaccines alone
    when #Base.Disease = 'COVID19' and status = 'immune' and vaccination_list like '1 | 1 | 1%' then 'correct'
    when #Base.Disease = 'influenza' and status = 'immune' and vax.VZVvax_count >0 then 'correct'
    when #base.Disease = 'Pertussis' and status = 'Immune for 10 years' and maxvax.maxdate > dateadd(year,-10,SYSDATETIME()) then 'correct'
    when #base.Disease = 'Meningococcal for Micro staff' and status = 'Immune for 5 years' and menb.maxdate > dateadd(year,-5,SYSDATETIME()) and menCV.maxdate > dateadd(yea
-- serology rules
     when #base.Disease = 'Tuberculosis' and status = 'Completed not immune ' and es.SerologyResultlabel in ('unlikely','Negative') then 'correct'
     when #base.Disease in ('HepB','Rubella','VZV (Chickenpox)','measles','Mumps') and status = 'immune' and es.SerologyResultLabel in ('positive','low positive') and hbsAg
     when #base.Disease in ('HepB') and status = 'immune' and es.SerologyResultLabel = ('Negative') and hbsAg.SerologyResultLabel = 'Positive' then 'correct'
-- Negative VZV
    when #Base.Disease = 'VZV (Chickenpox)' and status = 'immune' and es.SerologyResultLabel = 'negative' and vaccination_list = '1 | 1 | 1' then 'correct'
    when #Base.Disease = 'VZV (Chickenpox)' and status = 'immune' and ISNULL(es.SerologyResultLabel, 'negative') IN ('negative', 'equivocal') and vaccination_list = '1 | 1
-- Non responder HepB
    when #Base.Disease = 'HepB' and status = 'Completed not immune ' and es.SerologyResultLabel = 'non responder' and (hbsAg.SerologyResultLabel = 'Negative' or hbsAg.Emplo
    when #Base.Disease = 'HepB' and status = 'Completed not immune ' and hbsAg.SerologyResultLabel like '%Positive' and es.SerologyResultLabel = 'No'  then 'correct'
    when #Base.Disease in ('HepB','Rubella','VZV (Chickenpox)','measles','Mumps') and status = 'Completed not immune ' and contra.EmployeeNumber is not null   then 'correct

-- Negative Measles,Mumps
    when #base.Disease in ('measles','Mumps') and status = 'immune' and (es.SerologyResultLabel IN ('negative', 'equivocal') or es.SerologyResultLabel is null) and VZVvax_c
-- Negative Rubella
    when #base.Disease in ('Rubella') and status = 'immune' and (es.SerologyResultLabel = 'negative' or es.SerologyResultLabel is null) and VZVvax_count  >=2 and maxvax.max
-- Likely TB
     when #base.Disease = 'Tuberculosis' and status = 'Completed not immune ' and es.SerologyResultlabel in ('likely','positive') and VZVvax_count =2 and maxvax.maxdate > d
-- Not yet complete
    when #Base.Disease in ('HepB','Rubella','VZV (Chickenpox)','measles','Mumps','Tuberculosis','pertussis','Meningococcal for Micro staff') and status = 'not yet complete'
    when #base.Disease in ('measles','Mumps','rubella') and dob < '1966-01-01' and Status = 'age immune' then 'correct'
correct'
```

```
menCV as ( select EmployeeNumber
    ,   disease='Meningococcal for Micro staff'
    , max(datereceived) as maxdate
    from [Workforce].[dbo].[employeevaccines](nolock) ev
    where VaccineID in (8,6,9)
    group by employeenumber
    )

    ,

    menb as (
    select EmployeeNumber
    ,   disease='Meningococcal for Micro staff'
    , max(datereceived) as maxdate
    from [Workforce].[dbo].[employeevaccines](nolock) ev
    where VaccineID in (7)
    and DoseID >1
    group by employeenumber
    )
    ,
```

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Results of automation

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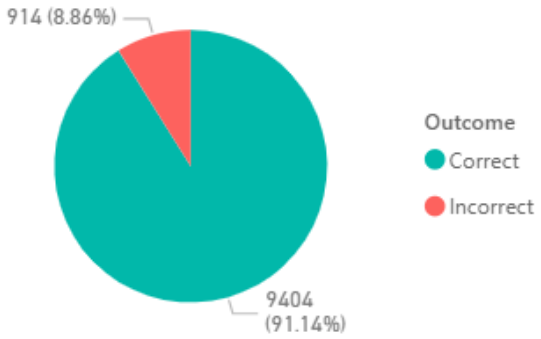
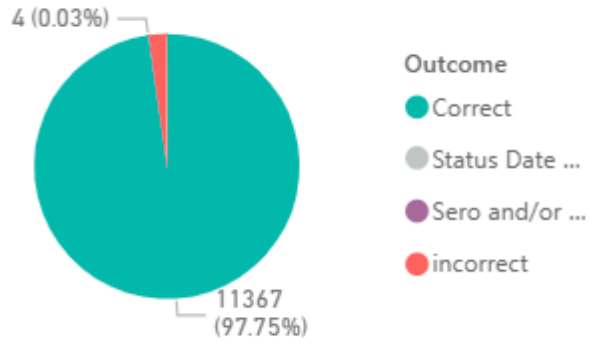
Before
Nov 23

After
Nov 25

Results: Hepatitis B

- From 91% to 95%
- Currently 98%





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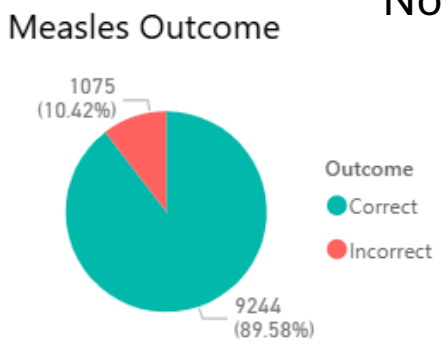
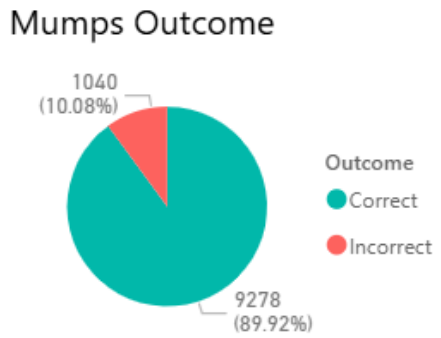
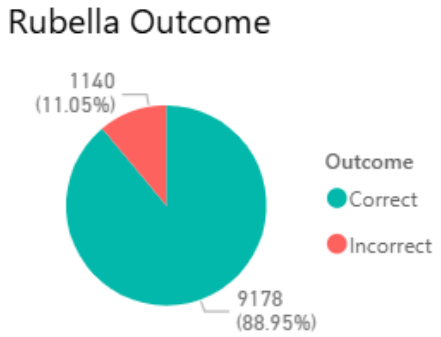
Results: MMR

- From ~90% to 94%
- Currently 97-99%

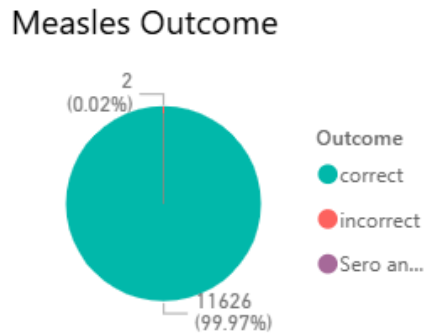
Before
Nov 23

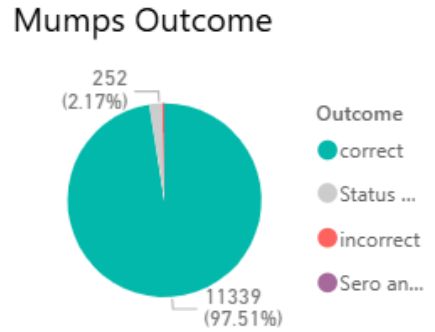


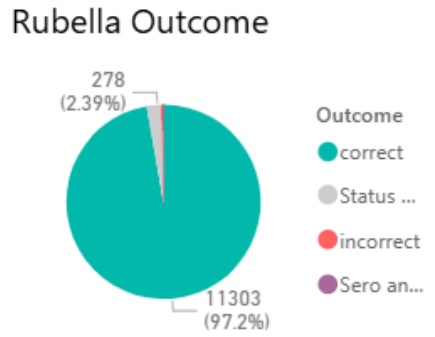




After
Nov 25







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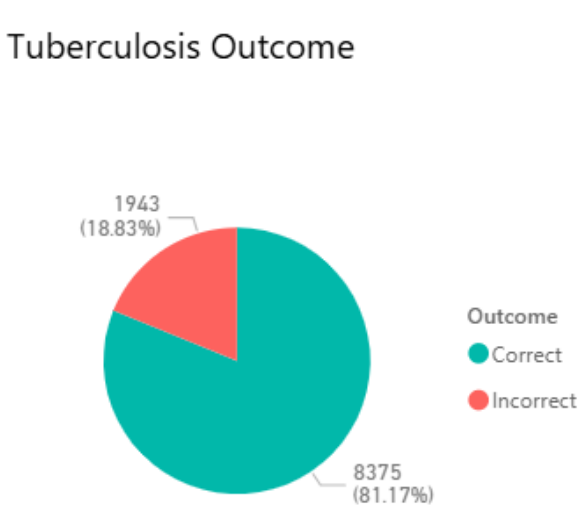
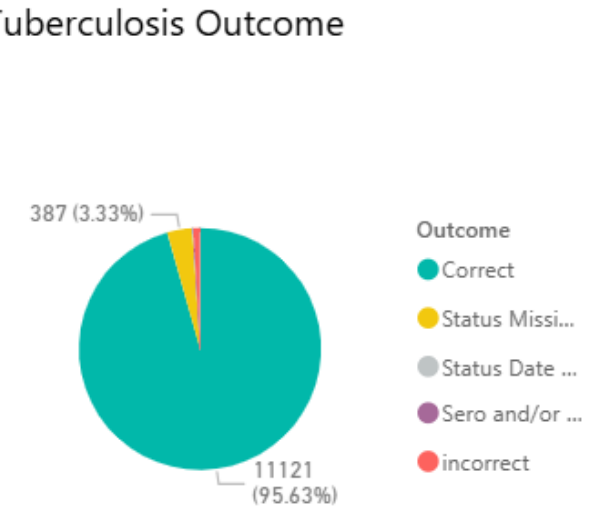
Before
Nov 23

After
Nov 25

Results: TB

- From 81% to 94%
- Currently 96%





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Before
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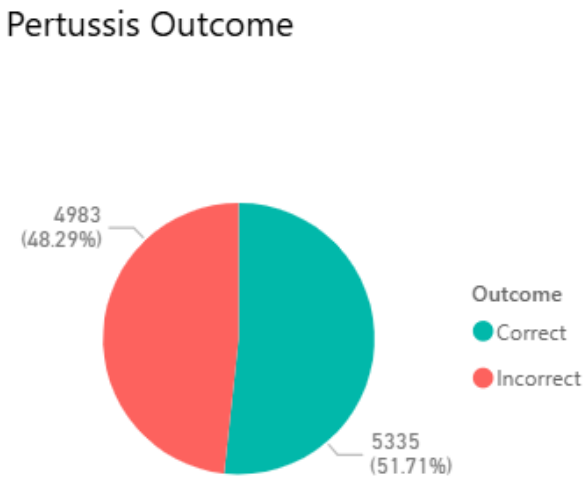
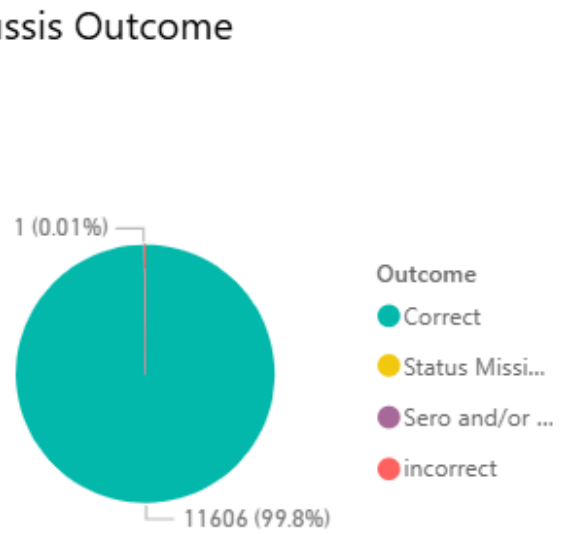
After
Nov 25

Results: Pertussis

- From 52% to 99%
- Currently 100%





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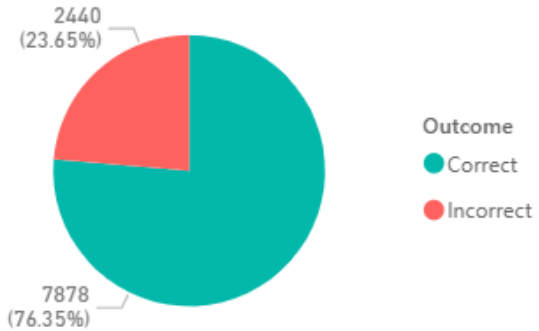
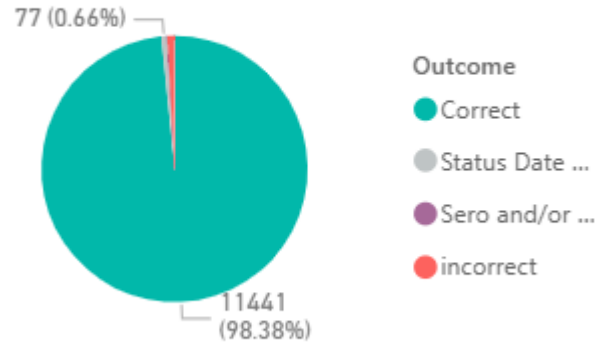
Before
Nov 23

After
Nov 25

Results: VZV

- From 76% to 98%





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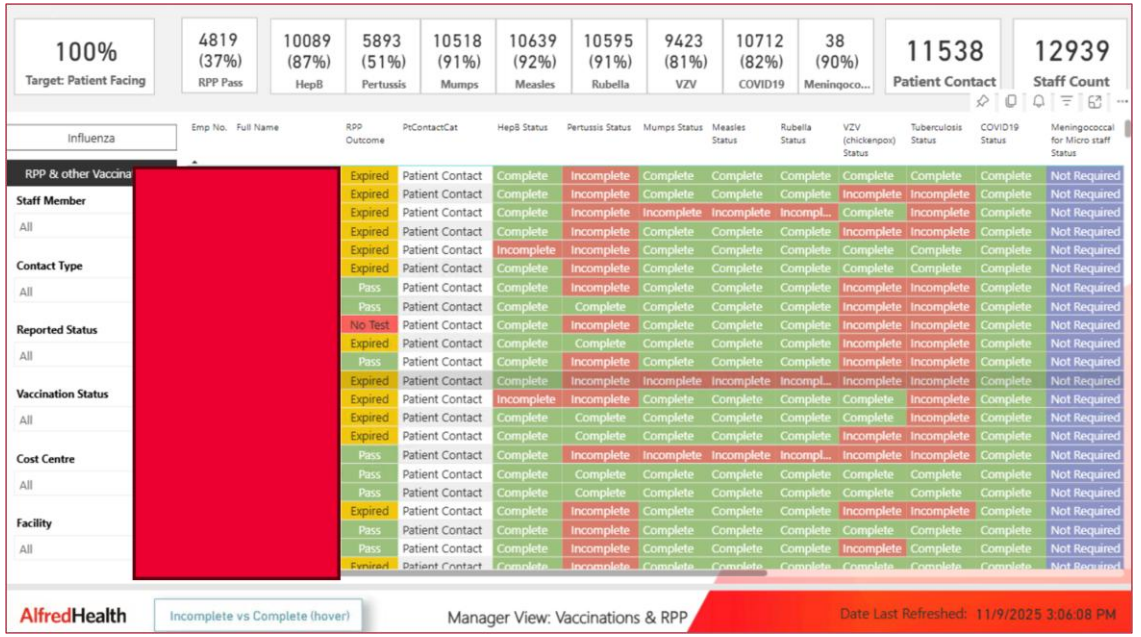
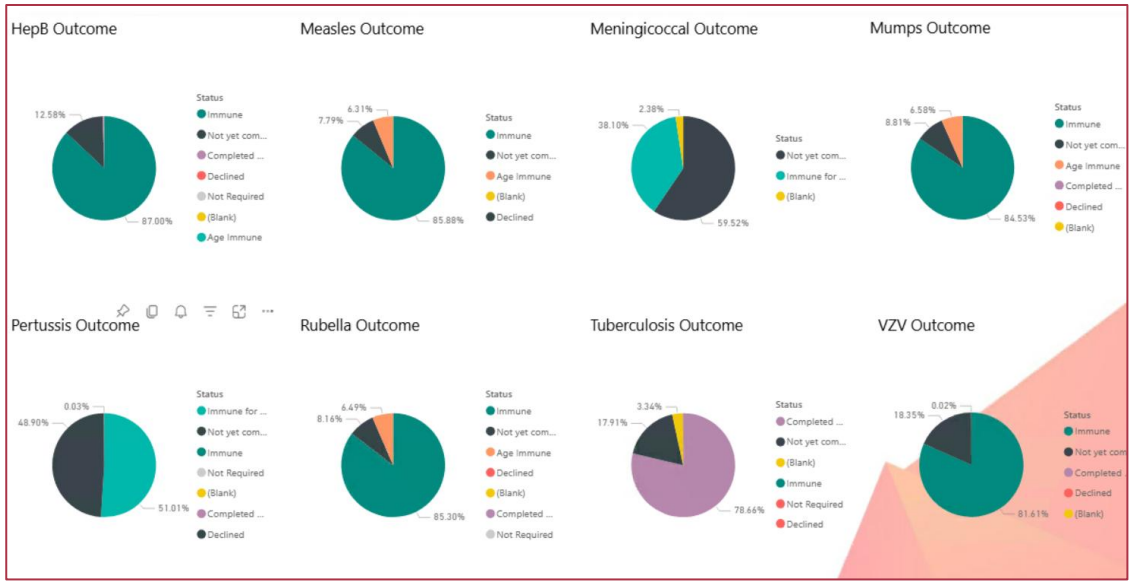
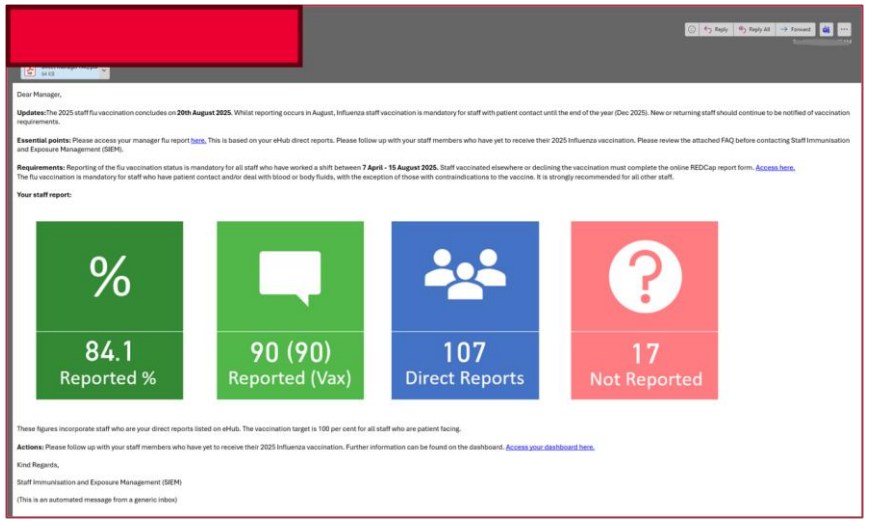
Onwards Improvements:

- Daily refresh and review of all staff medical pathology and vaccinations
- Improved review of contact tracing times
- Democratised review of staff







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Final thoughts

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Data maturity, security and reliability

- Process facilitated by maturity of data warehouse
- Allows for Row Level Security (RLS) on dashboards – can tailor to recipients/groups
- Any lost/incorrect data can be restored from Cerner – single source of truth

Assisting with other SIEM requirements

- Upcoming mandated vaccines – working with clean data
- Managing vaccination requirements – stock levels and expiry dates

Use case for AI

- Hard-coded outcomes with logical rules
  - Not a logical use case for AI

Bayside Health Merger 2026

- 13,000 staff → 22,000 staff
- Automatically* update information for SIEM

(*Should!)

Acknowledgements

Infection Prevention and SIEM:

Fiona Holzer, Sue McLellan, Pauline Bass and Andrew Stewardson

Data Analytics Service:

Lewis Piera, Vito Sikiric and Mya Pham

Epidemiology and Data Management Service:

Matt Hacket, Adithi Ramachandra, Kirsty Sim, Duangmanee (Fon) Seedam, Katherine Berry and Lana McCartney

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