

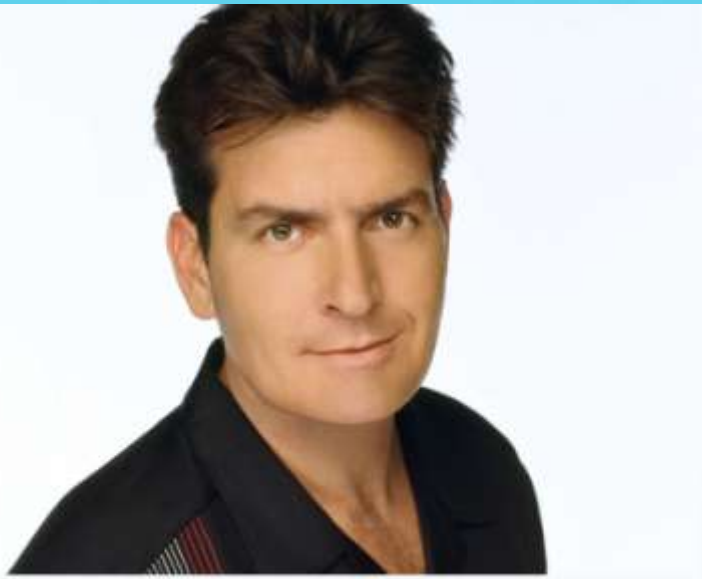
# Bursting Forth With Infection

## “I guess that’s why they call it the blues”

**Donald Inverarity**

Medical Microbiology Department, Royal Infirmary of Edinburgh, NHS Lothian







# Novel Psychoactive Substances (NPS)



A glass jar is tilted, spilling a large amount of bright blue, crystalline bath salts onto a white surface. The salts are piled up and scattered around the base of the jar. The text "BATH SALTS" is overlaid in white on the left side of the image.

**BATH SALTS**



# Introduction

- New psychoactive substances (NPS) are drugs that mimic psychoactive effects of illicit recreational drugs.
- NPS avoided regulation under the Medicines Act 1968 as labelled “not for human consumption” but manufacture, supply or importation is now illegal since 6<sup>th</sup> April due to Psychoactive Substances Act.
- Marketed under different guises
  - e.g. “bath salts”, “plant food”



# NPS in Lothian 2014

- Gaining popularity
  - In newsagents and “head shops”
- Burst / Blue Stuff:
  - Active ingredient  
Ethylphenidate







## Blue Stuff

Manufacturer: N/A

Availability: **In stock**

Top Quality Concentrated Bath Salts Powder - Blue Stuff. Do you have some anxiety and stress issues? Are you finding hard to shake these worries away? Blue Stuff is the Solution all your problems. 500mg and 1g Available..

**\$16**

Qty:

Cost and Weight: 500mg - \$16

[Add to Cart](#)



[Description](#)

[Disclaimer](#)

[Reviews \(3\)](#)

Top Quality Concentrated Bath Salts Powder - Blue Stuff. Do you have some anxiety and stress issues? Are you finding hard to shake these worries away? Blue Stuff is the Solution all your problems. Step in and immerse yourself completely. You will be amazed with the level of satisfaction you would get. It would wash away all the harsh emotion and thoughts leaving you with Blissful ones.

500mg and 1g Available.

[Home](#)[My Account](#)[Shopping Cart](#)[Checkout](#)[About Us](#)[Contact Us](#)[My Cart](#) \$[Home](#) / [BathSalts6](#) / [Ethylphenidate](#) /

## Ethylphenidate

Manufacturer: N/A

Availability: In stock

Top Quality Bath Salt Powder - Ethylphenidate. There are different types of bath salts but this one stand unique and outstanding. 500mg and 1g Available..

**\$15**

Qty:

Cost and Weight

[Add to Cart](#)[Description](#)[Disclaimer](#)[Reviews \(3\)](#)

Top Quality Bath Salt Powder - Ethylphenidate. There are different types of bath salts but this one stand unique and outstanding. It will take your satisfaction to another level, leaving you with nothing to worry about. It's hyper strength is not easily forgotten as it would work on you immediately. This is almost like bringing your fantasy to reality.  
500mg and 1g Available.



**100% MONEY BACK  
GUARANTEED**

Ut tellus dolor, dapibus eget,  
elementum vel, cursus eleifend, elit.  
Aenean auctor wisi et urna.

[Read More](#)

**SAFE & SECURE  
PAYMENT**

Ut tellus dolor, dapibus eget,  
elementum vel, cursus eleifend, elit.  
Aenean auctor wisi et urna.

[Read More](#)

# Early Warnings

- 14 *S. aureus* bacteraemias (SAB) in people who inject NPS in Lothian Oct. 2013 – Sept. 2014
  - Presentations seem different with lots of deep organ abscesses
  - “been a lot of IDUs with endocarditis recently”
- September 2014 - Large number of severe *S. pyogenes* infections in people who inject presenting to RIE A&E and Orthopaedics
- October 2014 DI takes up post in NHS Lothian “What’s Burst???”



# Dates of IMT meetings

- 24<sup>th</sup> October 2014
- 5<sup>th</sup> December 2014
- 20<sup>th</sup> January 2015
- 17<sup>th</sup> March 2015
- 20<sup>th</sup> April 2015
- 11<sup>th</sup> May 2015
- 15<sup>th</sup> June 2015
- 21<sup>st</sup> July 2015
- 24<sup>th</sup> August 2015
- 5<sup>th</sup> October 2015
  - Final IMT meeting and debrief

# Outbreaks within an Epidemic

- *S. aureus* infections
- *S. pyogenes* infections
- Hepatitis C infections
- Criminality (thefts and stabbings)
- Suicides
- Antisocial behaviour (littering with drug paraphernalia, sex offences)
- Psychosis and mental health admissions



# Background





# Steven Hendry charged with attempted murder of police officer in Edinburgh

🕒 7 July 2014 | [Edinburgh, Fife & East Scotland](#)



**A POLICEMAN was stabbed four times after a knife-wielding man charged at armed response officers in front of stunned rush-hour crowds in Princes Street.**

The officers were on routine patrol when they spotted a man with blood running down his face sitting on a bench near the bottom of the Mound at around 5.15pm.

The man was acting strangely and “punching himself in the head”, according to one eyewitness.

When officers approached him, he charged at them waving a knife, stabbing one of them four times in the shoulder, witnesses said.

Police wrestled the man across busy lanes of traffic before firing a taser gun which saw him slump onto the westbound tramline.

Both the injured officer and the bloodied man have been taken to the Edinburgh Royal Infirmary for treatment.

0  
comments



**HAVE  
YOUR SAY**

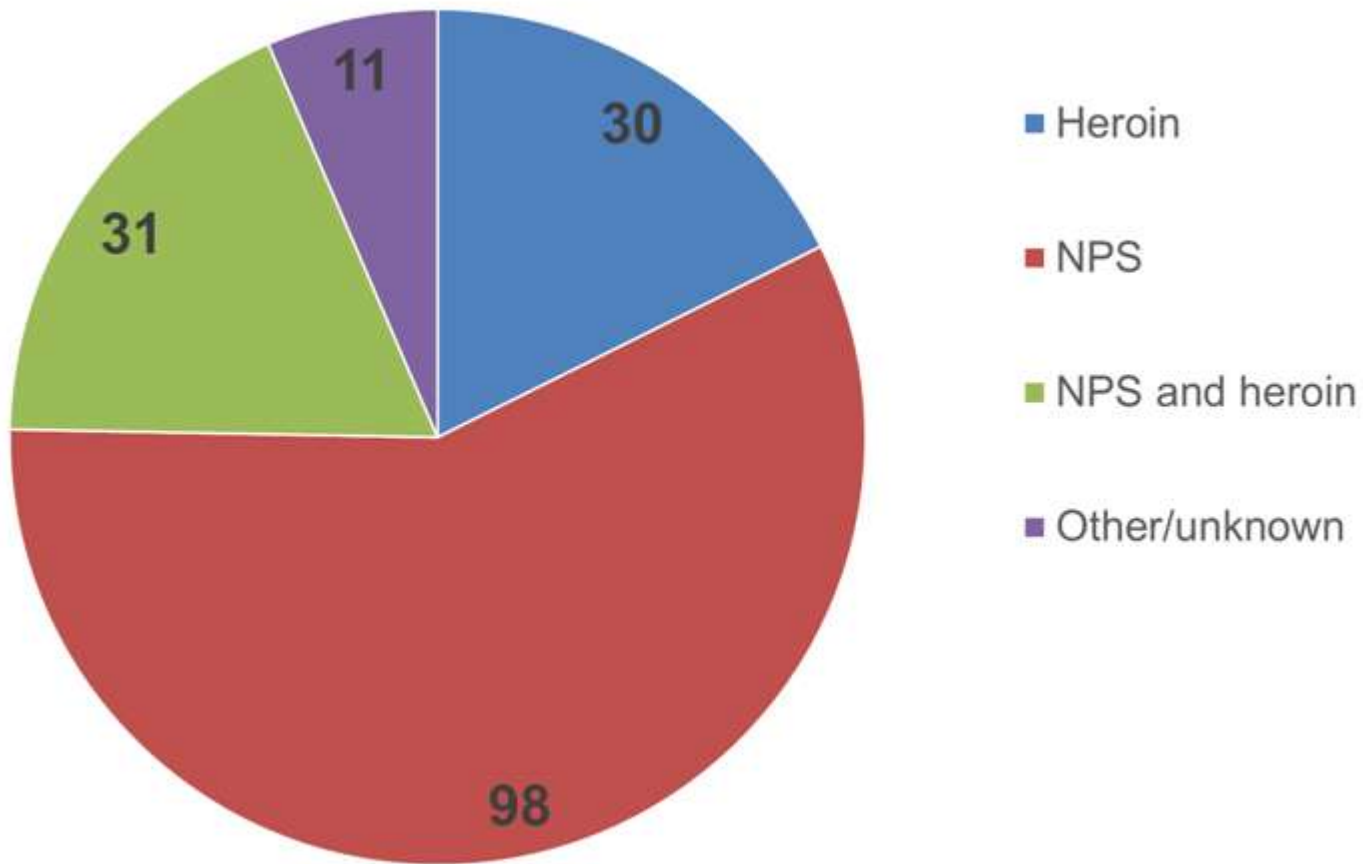
# What's Your Poison?

## (6 months of RIE NPS Toxicology Mar-Aug 2014)

- Amnesia (1)
- Bingo (1)
- Black Mamba (4)
- Blue stuff/ Burst (79)
- Brain (1)
- Bullet (1)
- Chalk White (1)
- Chibs (1)
- Clockwork Orange (1)
- Columbiana (3)
- Crystal Clear (5)
- Cyclone (1)
- Diesel (3)
- Dragon (1)
- Exodux Damnation (1)
- Go Caine (1)
- Green Vision (1)
- Happy Jocker (1)
- Ice (1)
- Kratom (1)
- Mephedrone (8)
- Mr White (1)
- Pandora's Box (1)
- Reds (1)
- Red Exodus (8)
- Scooby Doo (1)
- Smurf (1)
- Snow White (1)
- Spangled (2)
- Spell Weaver (1)
- Stickman (1)
- Synthecaine (1)
- Voodoo (4)
- Xidust (1)
- Zeus (3)

# Patient drug use

N= 170



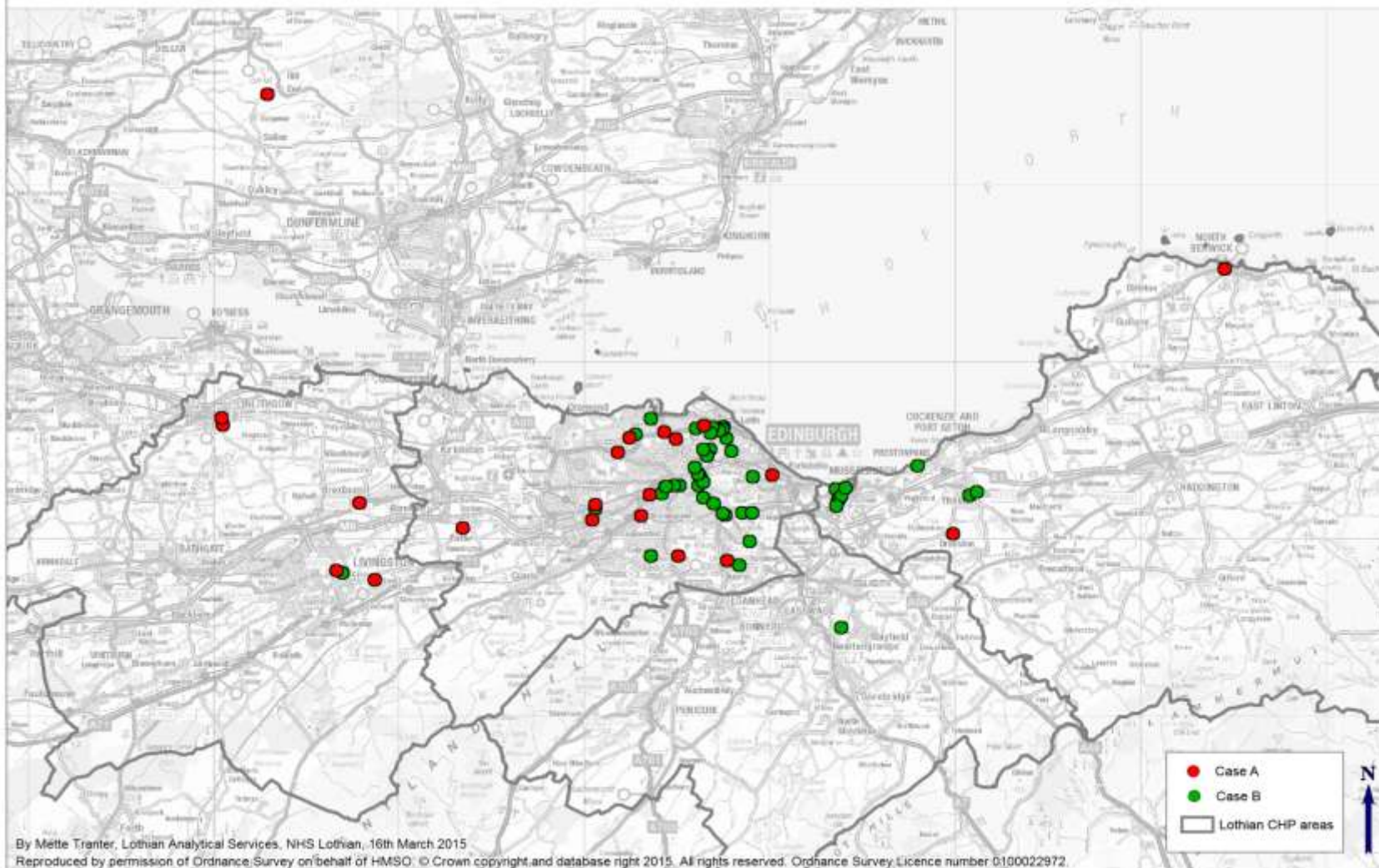


# Differences In Injecting Behaviour

- Larger bore needles
- No heating step
- Often no filters
- Dubious “water” used to dissolve and inject
- No lemon juice/ citrate use with ‘burst’
- Lack of muscle or skin popping
- Increased frequency of use – more skin punctures (x40 per day)
- Communal injecting (shared pots)
- Different demographic (student parties)
- New locations (Newington)



### Map showing cases



By Mette Tranter, Lothian Analytical Services, NHS Lothian, 16th March 2015

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# Home Sweet Home





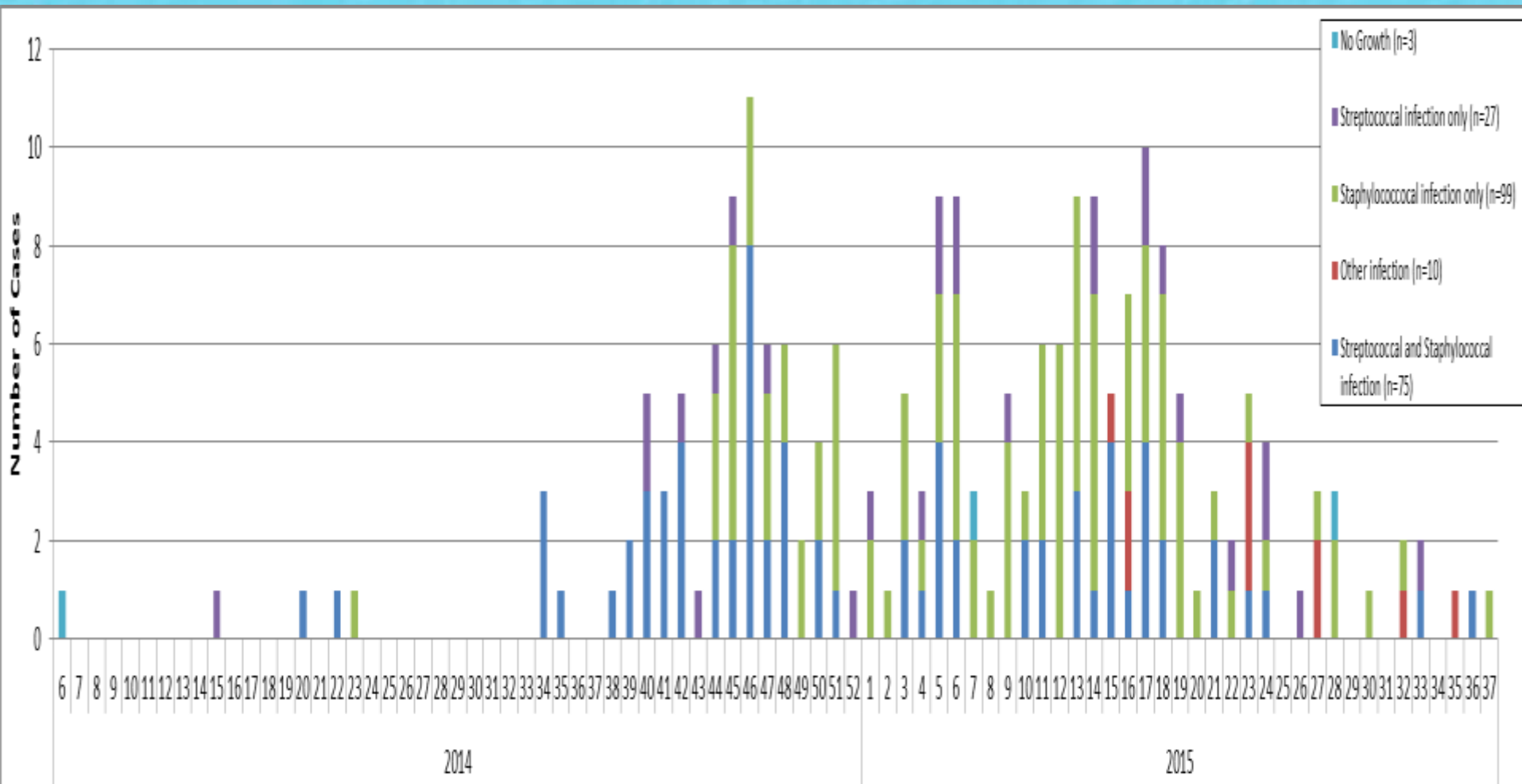
# Outbreak Investigation

- From 1<sup>st</sup> October 2014 to 1<sup>st</sup> July 2015 all new clinical isolates of *S. aureus* and *S. pyogenes* from adults aged 16 to 59 within NHS Lothian were collected prospectively as part of a public health investigation.
- All cases where *S. aureus* or *S. pyogenes* were isolated from a person who injects drugs (PWID) were reviewed.

# Outbreak Investigation

- Patients were categorised as:
  - Confirmed NPS injectors
  - Possible/non-NPS injectors (known PWID but no documentation of confirmed NPS use).
- Analysed as ‘infection episodes’
  - Defined as a positive culture result with either *S. aureus* or *S. pyogenes* with evidence of infection within a 14-day period.

# Epi Curve





# Organisms

Infection	Number of Cases	Percentage of all cases (%)
<b>Total number of cases streptococcal and/or staphylococcal infections</b>	<b>201</b>	<b>93.9</b>
<i>Streptococcus pyogenes</i> Group A	27	13.4
<i>Staphylococcus aureus</i>	99	49.8
<i>Streptococcus pyogenes</i> Group A and <i>Staphylococcus aureus</i>	75	36.8
<b>Number of cases with Other soft tissue infection</b>	<b>10</b>	<b>4.7</b>
<b>No growth but clinical signs of infection</b>	<b>3</b>	<b>1.4</b>
<b>Total</b>	<b>214</b>	<b>100</b>

# Summary of infection episodes



	<i>S. pyogenes</i>	Mixed	<i>S. aureus</i>	
<b>Infection episodes</b>	32	47	131	NPS
	7	7	44	non-NPS
<b>Hospital admissions</b>	28	42	80	NPS
	7	5	22	non-NPS
<b>Critical care</b>	2	3	8	NPS
	2	0	2	non-NPS
<b>Death</b>	0	1	3	NPS
	1	0	0	non-NPS
<b>Self discharge</b>	7	18	24	NPS
	1	0	4	non-NPS

Number = no. of patients

# Clinical Manifestations



“Embolic” necrotic skin lesions distal to injection sites progressing to ulceration



# Clinical Manifestations

Left shoulder post debridement in a severe *S. pyogenes* soft tissue infection



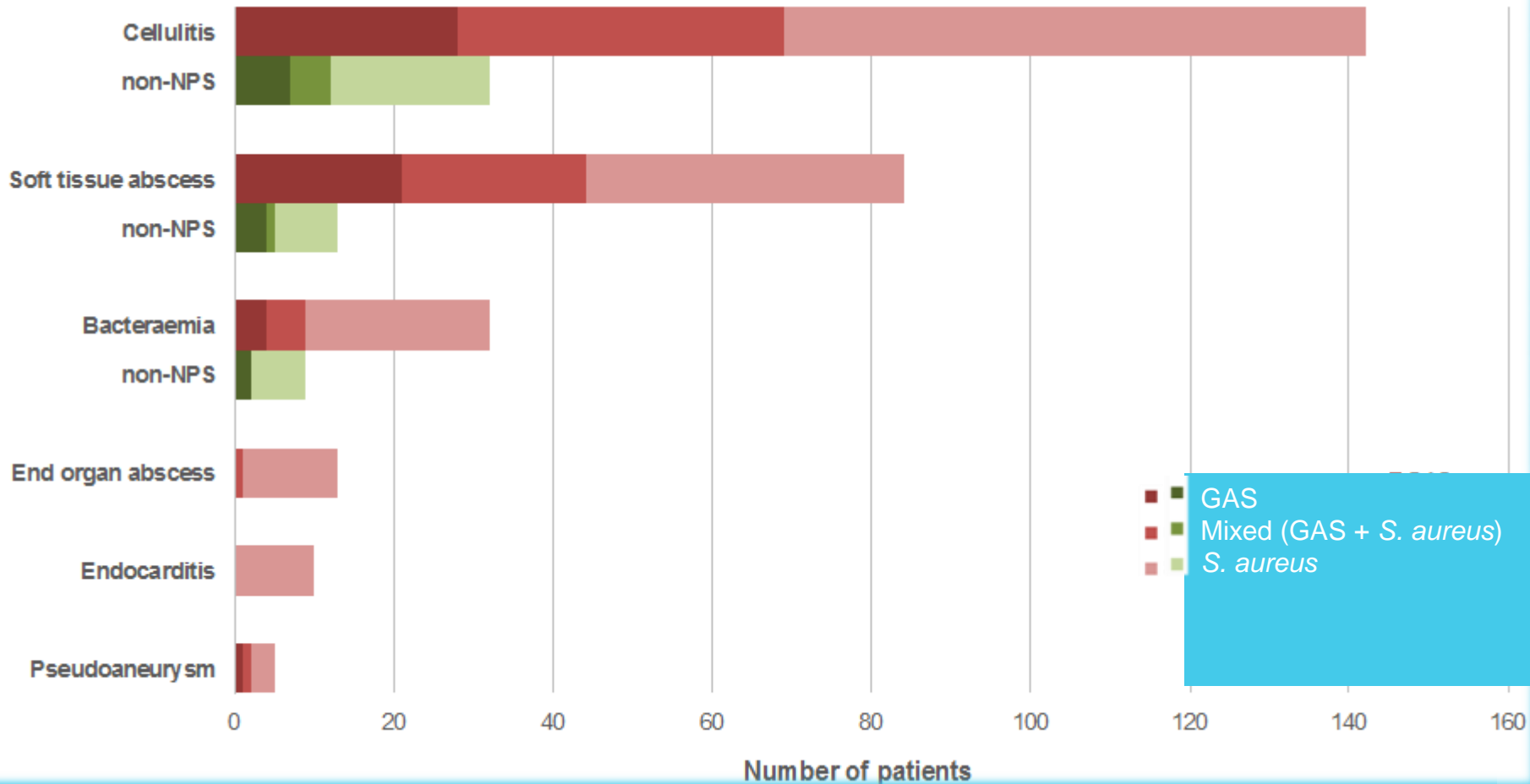
Bilateral below-knee amputations for uncontrolled infection secondary to septic emboli from endocarditis



# Injection Sites

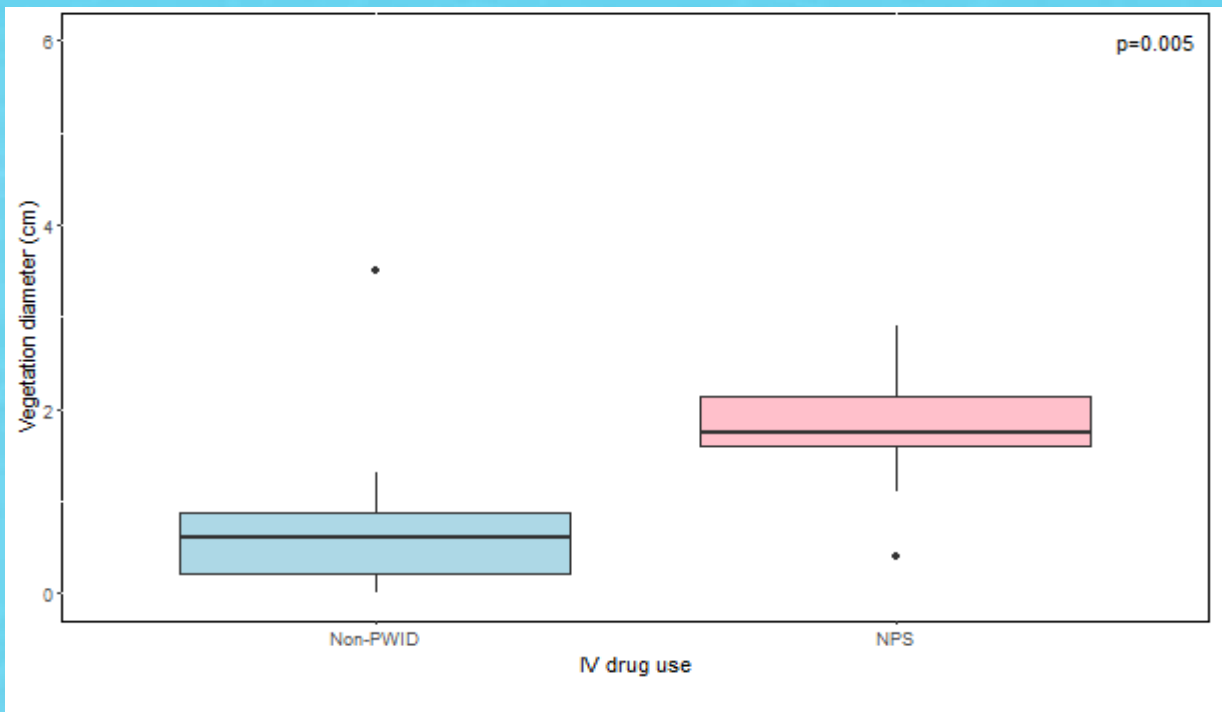
Anatomical Location of SSTI	NPS Associated (n= 102)	Opiate Associated (n =24)	P value
Leg	44 (43.1%)	9 (37.5%)	0.65
Arm	27 (26.5%)	8 (33.3%)	0.61
Hand	20 (19.6%)	2 (8.3%)	0.24
Groin	12 (11.8%)	15 (62.5%)	<0.0001
Foot	4 (3.9%)	1 (4.2%)	1
Buttock	4 (3.9%)	0	1
Breast	1 (1%)	0	1
Head	1 (1%)	0	1
Face	1 (1%)	0	1

# Presentation – NPS vs. non-NPS

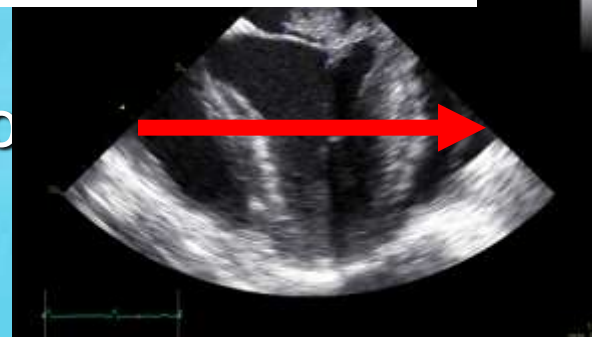




# Burst *S. aureus* Endocarditis



BIG Vegetation



# Burst *S. aureus* Endocarditis



**More Embolic Phenomena**

# Sources and Spread

- Is it in Burst?
- Is it in Heroin?
- Is it person to person spread?
- Why is the *S pyogenes* a clonal outbreak of M76 and *S aureus* appears not to be?

## ***Staphylococcus aureus* bacteraemia associated with injected new psychoactive substances**

---

D. J. GRIFFITH<sup>1</sup>\*, C. L. MACKINTOSH<sup>1</sup> AND D. INVERARITY<sup>2</sup>

<sup>1</sup> *Regional Infectious Diseases Unit, Western General Hospital, Edinburgh, UK*

<sup>2</sup> *Department of Microbiology, Royal Infirmary of Edinburgh, UK*

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### **SUMMARY**

Injecting drug use is often associated with deep-seated infection. In Lothian in Scotland there has been a recent increase in the use of injected new psychoactive substances (NPS). Patients who have injected NPS have presented with *Staphylococcus aureus* bacteraemia (SAB) with life-threatening complications. We describe a unique case-series of 14 episodes of SAB in ten patients. Users of injected NPS had a significantly higher incidence of endocarditis and cavitating pulmonary lesions ( $P < 0.05$ ) compared to those who inject only opiates. Cases of SAB in people who inject NPS have contributed to a significant rise in the overall incidence of SAB in people who inject drugs ( $P < 0.05$ ) which has in turn impacted on the ability of Lothian to meet national targets for reducing the incidence of SAB.



Table 2. Case summaries of SAB associated with injecting NPS in Lothian

Case no.	Presentation	At presentation					Complications of SAB	Antibiotic therapy		
		T (°C)	BP	HR	WCC	CRP		Agent	Duration (days)	Progress and outcome
1	Septic arthritis Diarrhoea Shock	39.2	92/54	92	11.7	143	Cavitating lung lesions Septic arthritis	Flucloxacillin i.v. Rifampicin p.o. Doxycycline p.o.	28 42 14	Completed 28 days i.v. therapy and 14 days p.o. follow-on. Did not attend follow-up and resumed injecting.
2	Fever Groin pain	40.1	100/52	74	12.3	208	Femoral vein septic DVT	Clindamycin i.v.	3	Absconded prior to diagnosis of SAB. Returned briefly but absconded again prior to treatment.
3	Pleuritic pain Haemoptysis	38.4	104/70	85	25.8	248	Endocarditis (TV and MV) Cavitating lung lesions Infective polyarthritis	Meropenem i.v. Vancomycin i.v. Flucloxacillin i.v.	2 2 At least 42	Initial broad-spectrum antibiotics due to sepsis. Rationalized to flucloxacillin. Transferred outside Lothian and completed 42 days i.v. flucloxacillin.
4	Cellulitis Chest pain	40.0	123/67	106	9.0	42	None known	Flucloxacillin i.v. Flucloxacillin p.o.	3 14	Poor compliance with i.v. therapy. Switched to p.o. when discharged against medical advice.
5	Leg swelling and erythema	38.5	105/44	62	15.3	261	Femoral vein septic DVT Groin abscess Infected CVC	Flucloxacillin i.v.	28	Continued NPS use during admission. Completed planned treatment.
6	Infected groin injection site	39.3	—	108	14.8	56	Groin abscess	Flucloxacillin i.v.	5	Absconded during treatment.
7	Fever Buttock pain Hand pain	38.6	110/77	98	12.1	237	Paraspinal abscess	Vancomycin i.v. Ceftriaxone i.m.	7 5 Unknown	Abscondment and ongoing injecting drug use. Poor compliance with therapy. Never reached therapeutic vancomycin level. Discharged against advice.
8	Pleuritic chest pain	37.2	89/50	70	10.7	296	Endocarditis Cavitating lung lesions Empyema	Flucloxacillin i.v. Rifampicin p.o. Clindamycin p.o.	42 (total)	Flucloxacillin given for 42 days. Absconded with chest drains <i>in situ</i> after completing therapy for SAB.
9	Cellulitis Dyspnoea	37.0	91/60	88	13.1	317	Endocarditis Cavitating lung lesions Thigh abscess	Flucloxacillin i.v. Clindamycin i.v. Daptomycin i.v.	79 (total)	Variable clinical course with multiple changes of antibiotic therapy. Completed planned treatment and was well at the time of discharge. Resumed injecting.
10	Fever Leg swelling	37.0	129/62	90	9.1	57	None known	Cotrimoxazole i.v. and p.o.	7 Unknown	Absconded after 7 days. Discharged with p.o. therapy on return. Ongoing injecting.

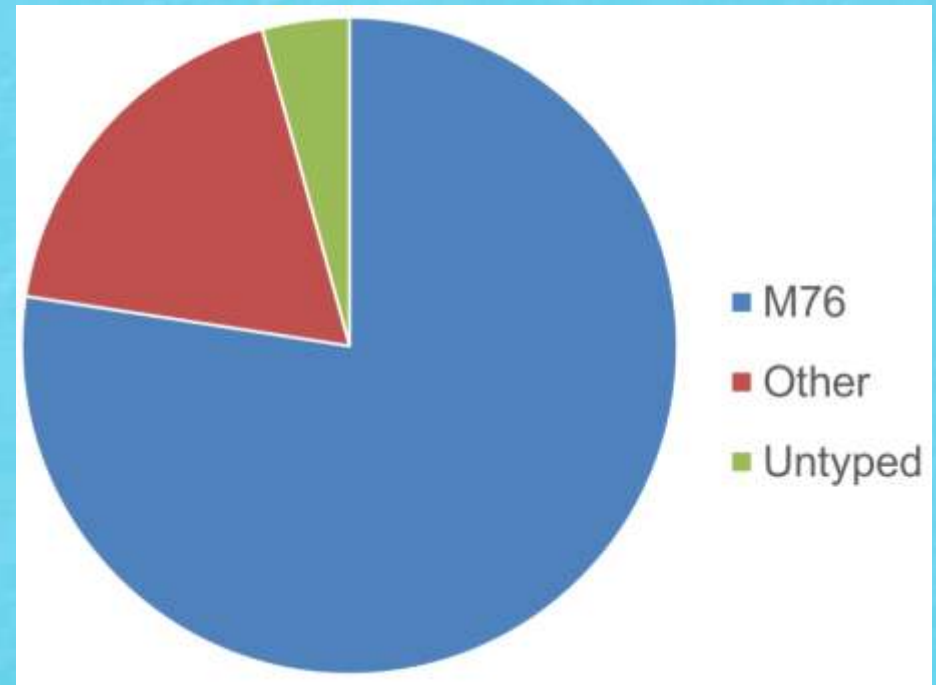
# Interventions to Prevent Transmission

- Optimal Case Management
- Tissue viability
- Personal hygiene and covering soft tissue lesions
- Promotion of Filters and clean water and clean “works”
- Discouraging communal pot reservoirs
- Education (SDF leaflet, needle exchanges)
- Encourage a return to opiate use
- Explored post exposure antibiotics for *S. pyogenes* contacts
- Temporary Class Banning Order
- New Psychoactive Substances Bill
- Opportunistic diphtheria boosters

# *S. pyogenes* emm types

	<i>S. pyogenes</i>	Mixed
<b>M76</b>	30	42
<b>Other</b>	6	11
<b>Untyped</b>	3	1

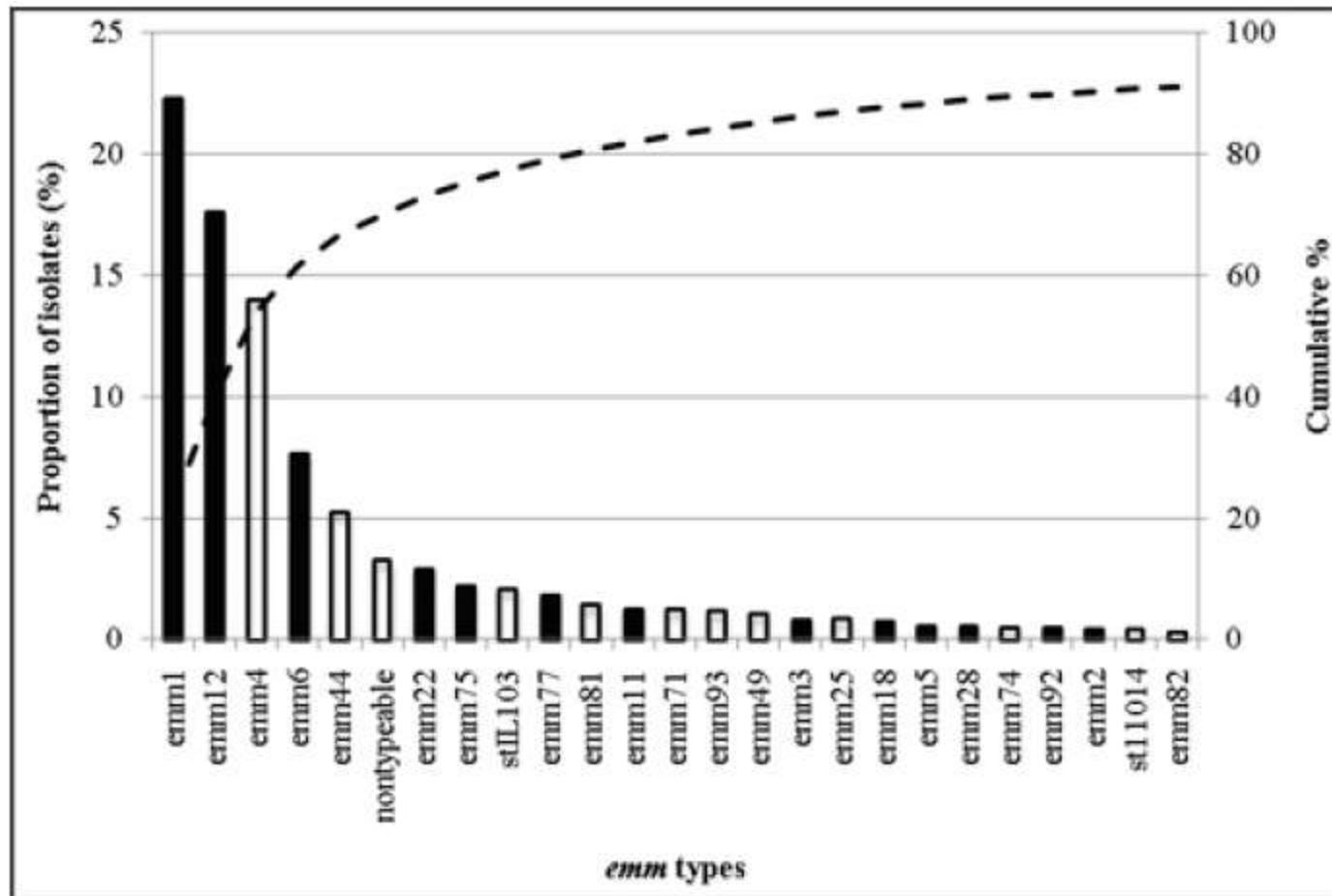
Organisms	Type	Count
<b><i>S. pyogenes</i></b>		<b>36</b>
	M 1.0	2
	M 3.1	1
	M76	30
	M82	1
	M89	2
<b>Mixed</b>		<b>53</b>
	M1.19	1
	M12	1
	M18	1
	M75	1
	M76	42
	M81	1
	M89	4
	M9	1
	M94.0	1
	<b>Grand Total</b>	



The outbreak M76 strain was ST378

# Coming from China?

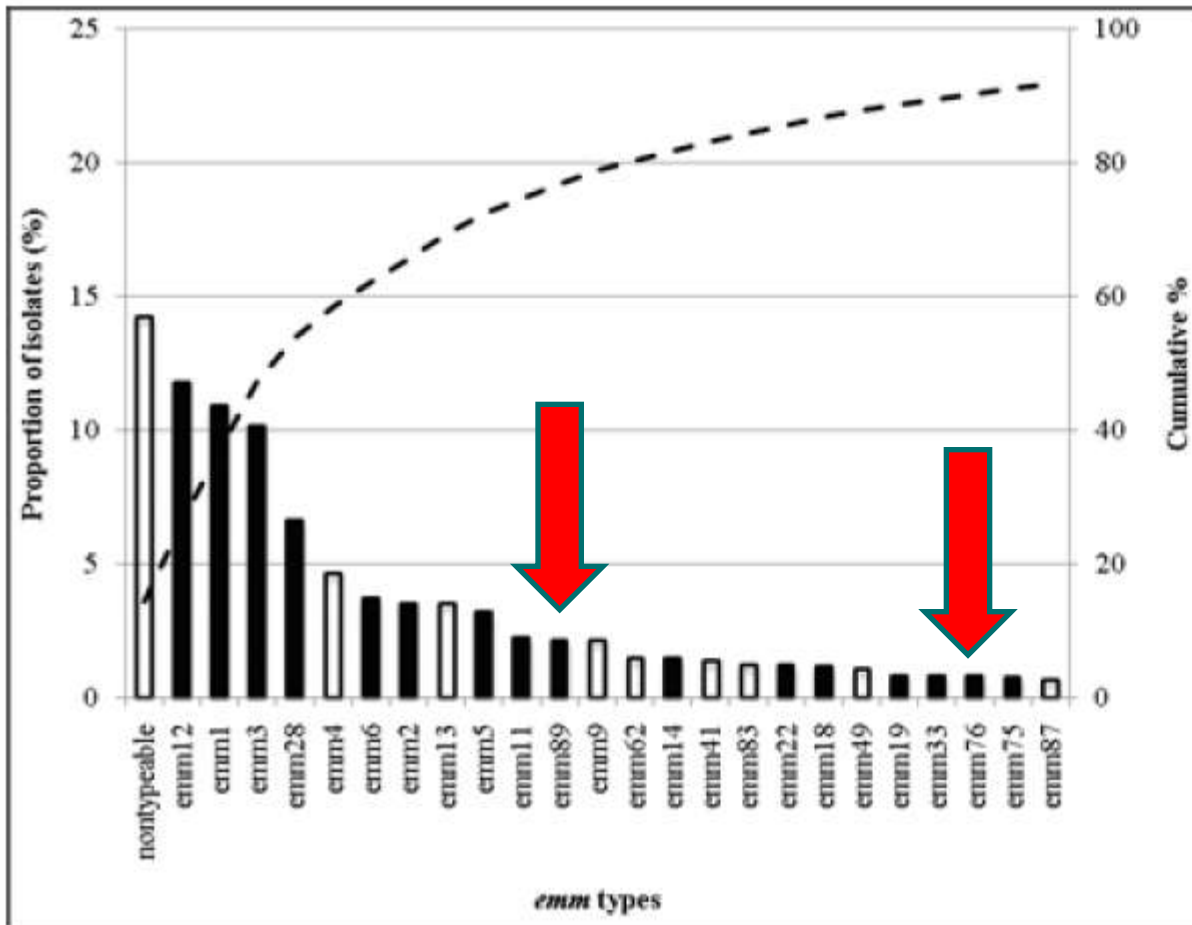
The 25 most common *emm* types contributing to all disease in Asia





# Or The Middle East?

The 25 most common *emm* types contributing to all disease in Middle East countries



# emm76

PubMLST

Query: [Search](#) |  
 Breakdown: [Isolate fields](#) | [Scheme/alleles](#) | [Publications](#)  
 Links: [Contents](#) | [Home](#) | [Options](#) | [Profiles/sequences definitions](#)

## Search or browse *Streptococcus pyogenes* isolates database

Enter search criteria or leave blank to browse all records. Modify form parameters to filter or enter a list of values.

Isolate provenance/phenotype fields

emm type = 76 + ⓘ

Display/sort options

Order by: id ascending

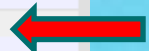
Display: 25 records per page ⓘ

Action

Reset

15 records returned. Click the hyperlinks for detailed information.

Isolate fields ⓘ								MLST								
id	isolate	aliases	country	year	primary disease	tissue source	disease other 1	gki	gfr	murl	mutS	recP	xpt	yqiL	ST	clonal complex
<a href="#">159</a>	CT98200		USA	1998	invasive, NOS	sterile site, NOS		11	8	3	6	8	27	4	50	
<a href="#">160</a>	CS110		USA					11	8	12	6	8	2	4	51	
<a href="#">848</a>	5297		Poland	1999	bacteremia	blood		11	8	3	6	8	27	46	378	
<a href="#">1032</a>	BSPY120		Switzerland	1999		URT		11	8	3	6	8	27	4	50	
<a href="#">1033</a>	BSPY139		USA	1999		URT		11	8	3	6	8	27	4	50	
<a href="#">1239</a>	149436		Czech Republic	2004	sepsis	sterile site, NOS		11	8	3	6	8	27	46	378	
<a href="#">1751</a>	AC104 throat	M 104 thr	Australia	1997	carriage	URT		4	61	50	11	14	55	4	291	
<a href="#">1790</a>	NS814		Australia	1990	impetigo	impetigo lesion		4	61	50	11	14	55	4	291	
<a href="#">2052</a>	152953	707	Czech Republic	2008	bacteremia	blood		11	8	3	6	8	27	4	50	
<a href="#">2130</a>	NS4706	RF-459	Australia	2005	carriage	URT		13	2	14	6	19	3	56	286	
<a href="#">2160</a>	NS5544	DRZ4	Australia	1993	impetigo	impetigo lesion		115	12	2	32	9	2	91	617	
<a href="#">2220</a>	NS822		Australia	1996	impetigo	impetigo lesion		4	61	50	11	14	55	4	291	
<a href="#">2291</a>	NS539		Australia	1995	impetigo	impetigo lesion		4	61	50	11	14	55	4	291	
<a href="#">2313</a>	NS1107		Australia	1997	pharyngitis and/or tonsillitis	URT		13	2	2	5	1	3	1	631	
<a href="#">2361</a>	13571		Norway	2011	bacteremia	blood	abscess	13	2	2	5	1	3	1	631	



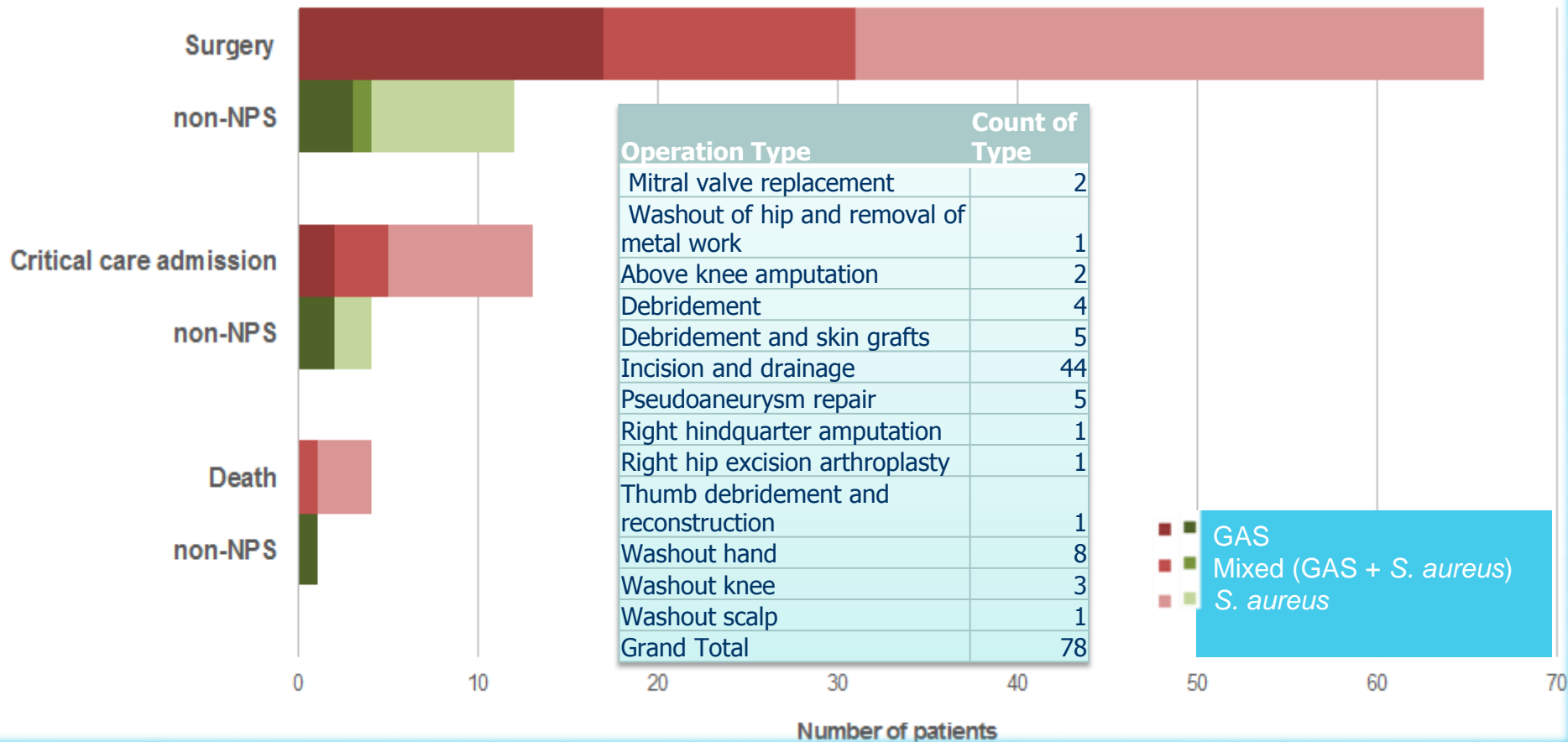
# Impact on Acute Hospital Services

- A total of **214 'infection episodes'** were recorded
- 170 individual PWIDs (median no. infection episodes = 1)
  - Male: 123 (72%), Mean age: 37 years

Total length of stay (days)	Number of cases	Percentage (%)
Not admitted to hospital	37	17.3
1	66	30.8
2-5	36	16.8
6-10	33	15.4
11-20	37	17.2
21-30	17	7.9
More than 31 days	31	14.4
Chronic	17	7.9
Total	214	100

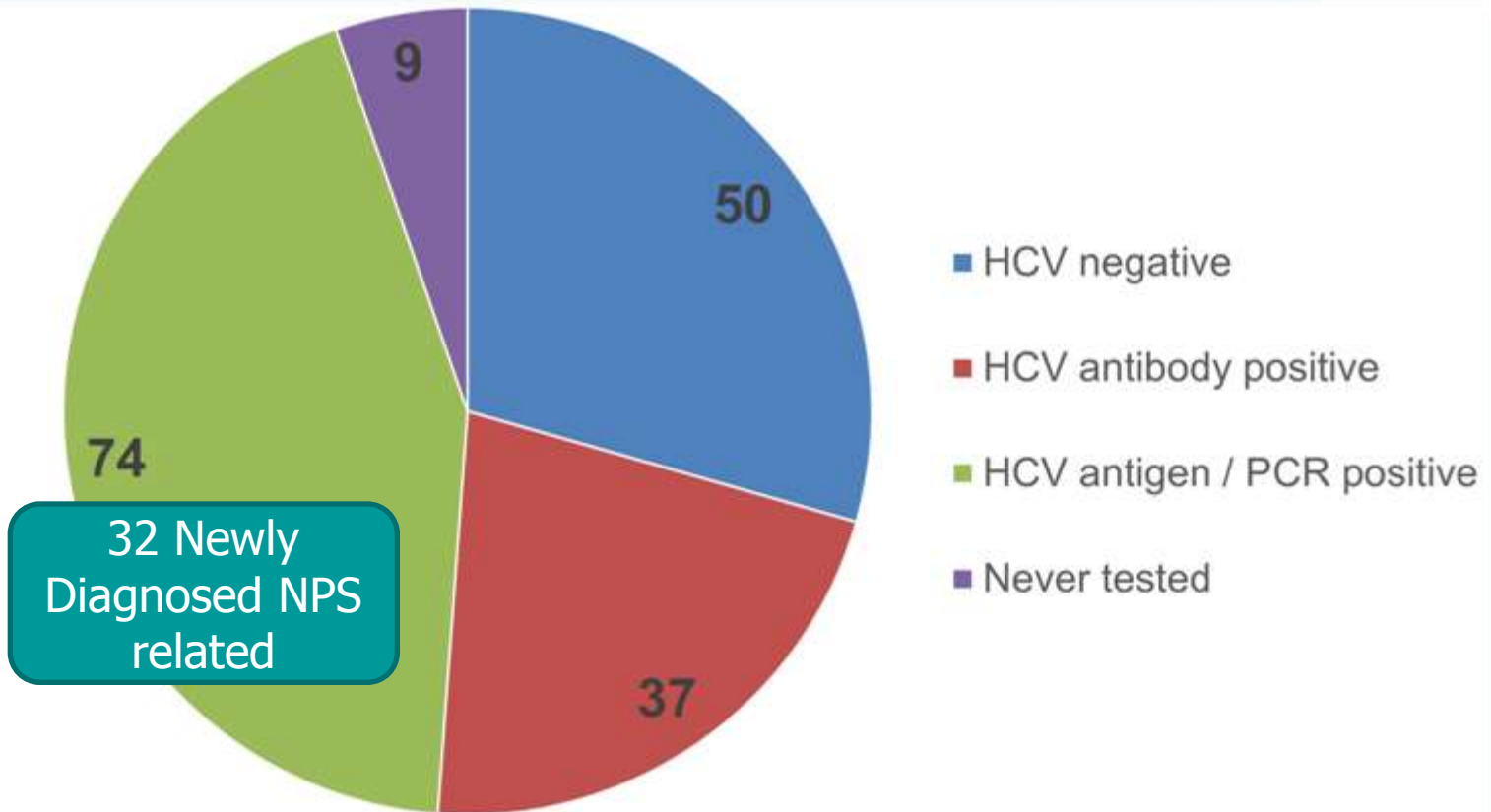
Number of hospital visits	Number of Cases	Percentage (%)
0	19	8.9
1	64	30.0
2-4	66	30.8
5-9	38	17.8
10+	10	4.7
Chronic	17	7.9
Total	214	100

# Outcomes – NPS vs. non-NPS





# Patient hepatitis C virus (HCV) status N= 170



# Other Significant Circulating Pathogens

- *Corynebacterium diphtheriae* (1 non toxigenic)
- *Clostridium novyii* (1)
- *Clostridium cadaveris* (1)
- HIV (2 known. None new – phew!)
- *Dolosigranulum pigrum* (1)
  
- BUT NO BOTULISM (meanwhile 24 PWID wound botulism cases in West Central Scotland)

# Conclusions

1. NPS (Ethylphenidate) injection causes severe infections associated with significant morbidity.
2. Large number of *S. aureus* and *S. pyogenes* infections in “Burst” users but also Hepatitis C.
3. *S. pyogenes* M76 (ST378) was the most common *emm* type.
4. Greater proportion of *S. pyogenes* infections managed in hospital relative to *S. aureus*.
5. *S. aureus* endocarditis, embolic phenomenon and deep organ abscesses frequently accompany Ethylphenidate injecting.
6. Infections can be difficult to manage due to high rates of self discharge and infection recurrences.
7. Clear differences between NPS and Opiate related infections (but complicated by NPS being found in heroin)

# Acknowledgements

- Mr. Jim Sherval – Chair, IMT
- Dr. Christine Evans – Public Health, NHS Lothian
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- Dr. Hannah Austin – Public Health, NHS Lothian
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- Members of IMT
- Scottish Haemophilus, Legionella, Meningococcus and Pneumococcus Reference Laboratory, Glasgow
- Scottish MRSA Reference Laboratory, Glasgow
- Dr Matt Holden, Scottish Healthcare Associated Infection Prevention Institute
- Scottish Drugs Forum and NHS Lothian Harm Reduction Team