CHOLERA

Community Medicine
Fourth-year medical students

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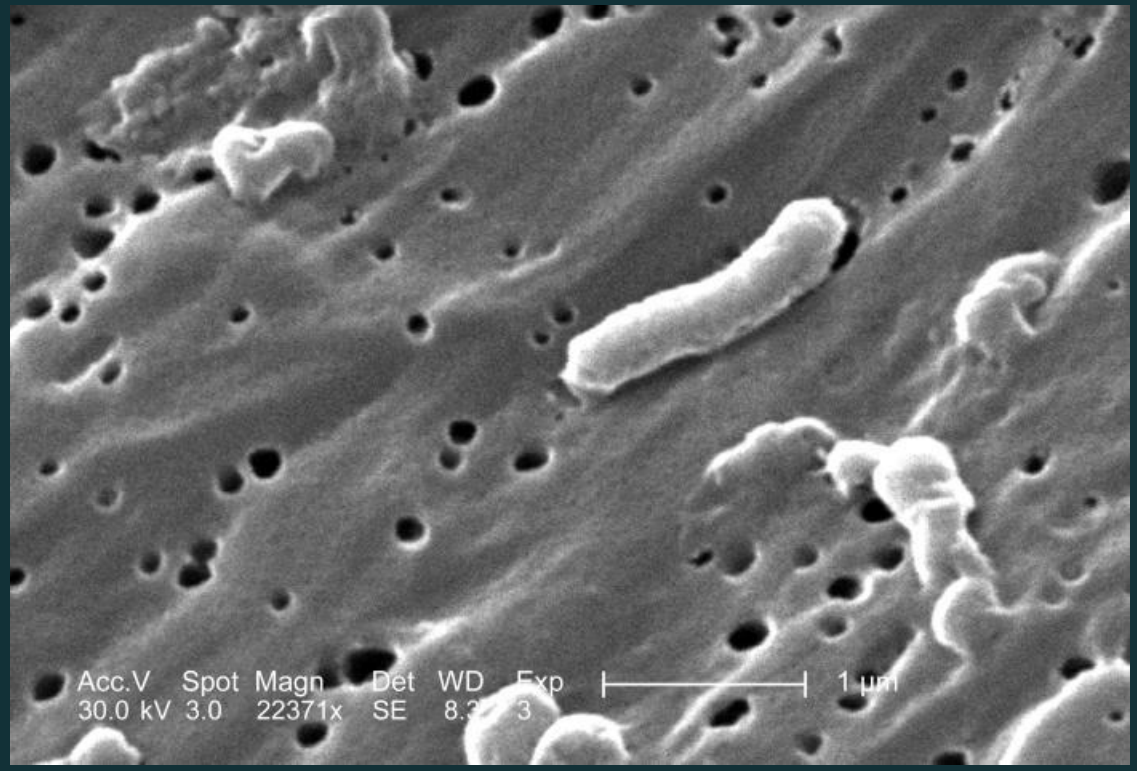


Scanning electron microscopy of Vibrio cholerae O1. Centers for Disease Control and Prevention / Janice Haney Carr, Public Health Image Library image 7818.

Learning outcomes and opening case

01 **Explain the agent, reservoir, transmission and determinants of cholera.**

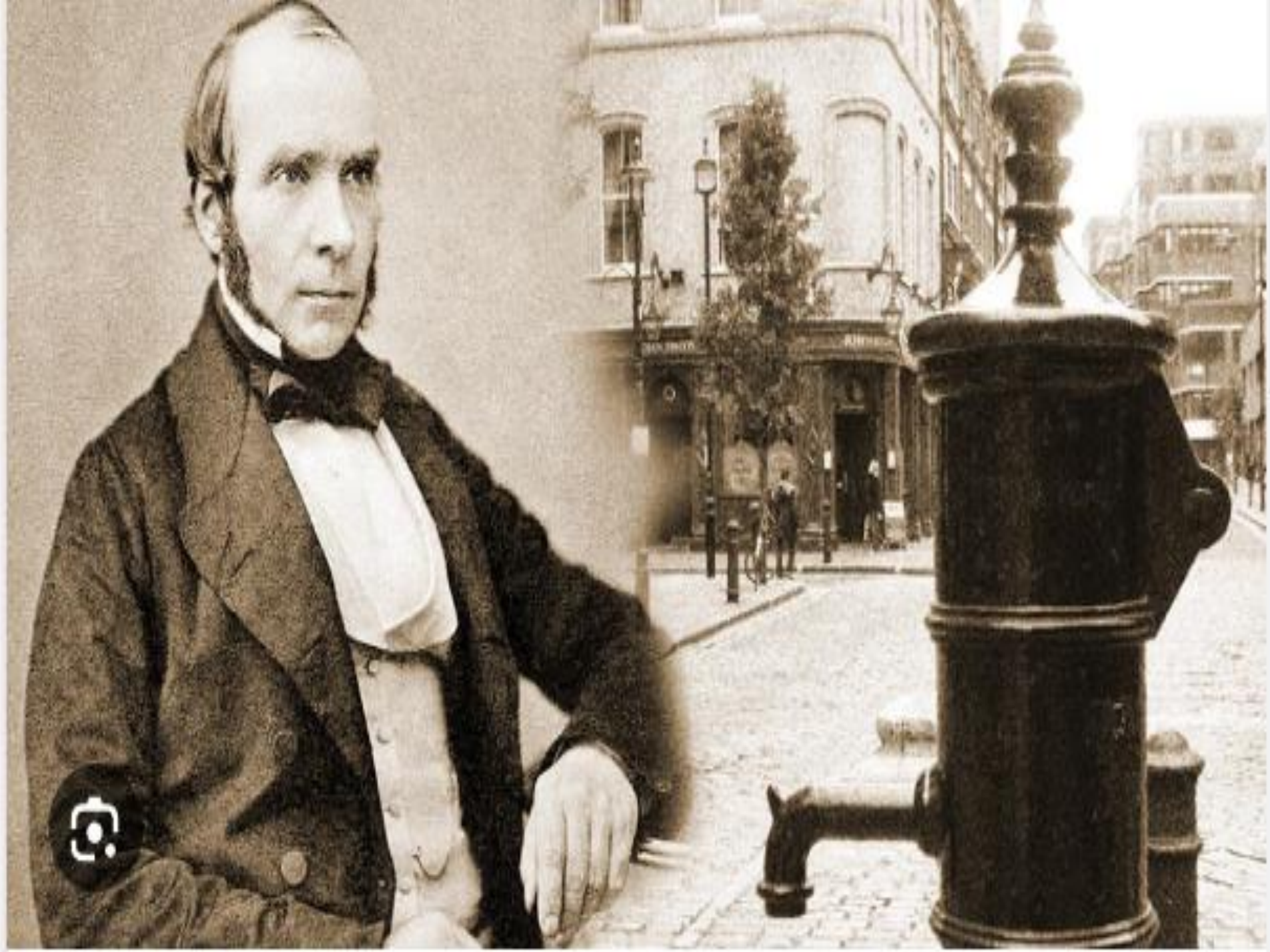
02 **Recognize dehydration and select an initial rehydration plan.**

03 **Apply surveillance definitions and investigate a community outbreak.**

04 **Interpret Iraqi data and propose prevention measures.**

A 22-year-old develops profuse watery diarrhoea after a shared meal. He is thirsty, weak and barely passing urine. What comes first?

Source links and complete image credits are in the speaker notes.





Map by Dr. John Snow of London, showing clusters of cholera cases in the 1854 Broad Street cholera outbreak

Cholera as a community medicine problem

V.: Vibrio; CDC: Centers for Disease Control and Prevention

01 Acute intestinal infection with toxigenic V. cholerae.

02 Faecal contamination spreads through water and food.

03 Rapid fluid loss can cause shock within hours.

04 Safe water and early treatment prevent deaths.



River-side settlement, CDC. Context photograph, not an Iraqi outbreak site.

Source links and complete image credits are in the speaker notes.

Global reported burden, 2024–2025

WHO: World Health Organization

WHO annual reporting	2024	2025
Countries reporting cases	60	47
Reported cases	560,823	451,499
Reported deaths	6,028	7,870
Overall deaths / cases × 100	1.07%	1.74%

Fewer reported cases, more reported deaths. Reporting coverage and case classification affect comparisons.

Source links and complete image credits are in the speaker notes.

Iraq: what the surveillance numbers mean

WHO: World Health Organization

Period	Measure	Reported figure
2022	Suspected cases	11,097
2022	Laboratory-confirmed	3,705
2022	Associated deaths	24
2024	Cases reported to WHO	596
2025	Cases reported to WHO	0

A zero report means no detected cases reported through surveillance. It does not establish elimination.

Source links and complete image credits are in the speaker notes.

Iraqi health authorities: the first 2022 signal

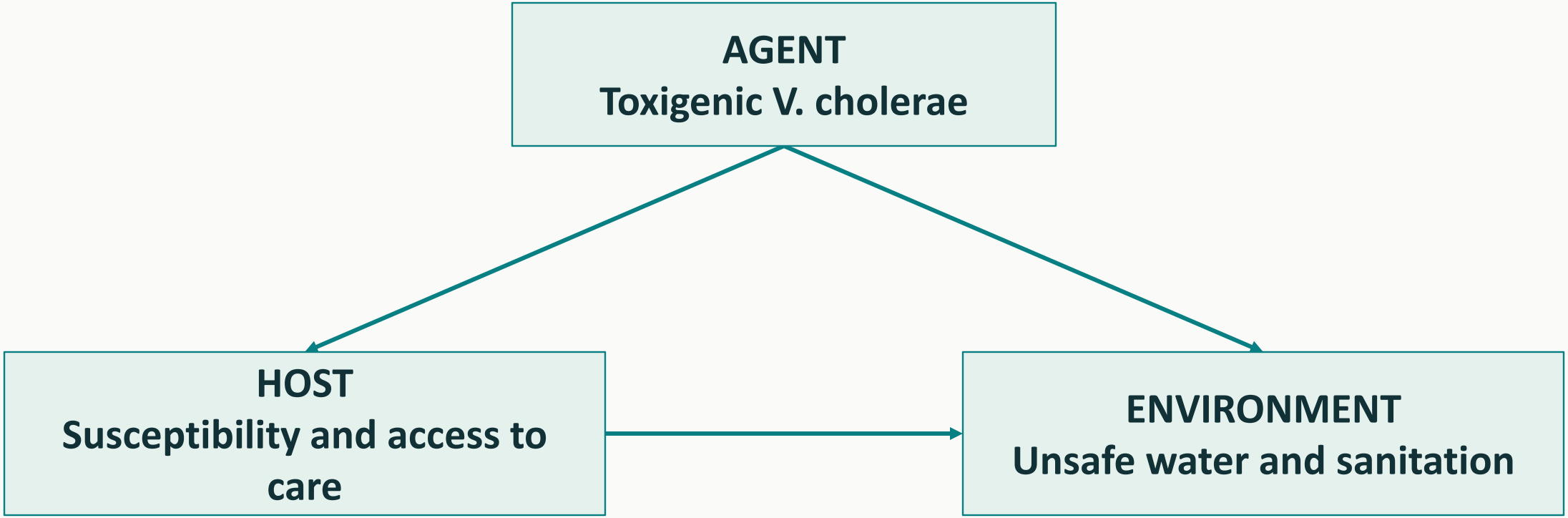
Central Public Health Laboratory confirmation	Cases
Sulaymaniyah	10
Muthanna	2
Kirkuk	1
Total by 20 June 2022	13

Historical early-outbreak snapshot, not the final 2022 total.

Source links and complete image credits are in the speaker notes.

Agent–host–environment framework

V.: Vibrio



Interventions can reduce exposure, improve host protection and prevent fatal dehydration.

Source links and complete image credits are in the speaker notes.

The causative organism

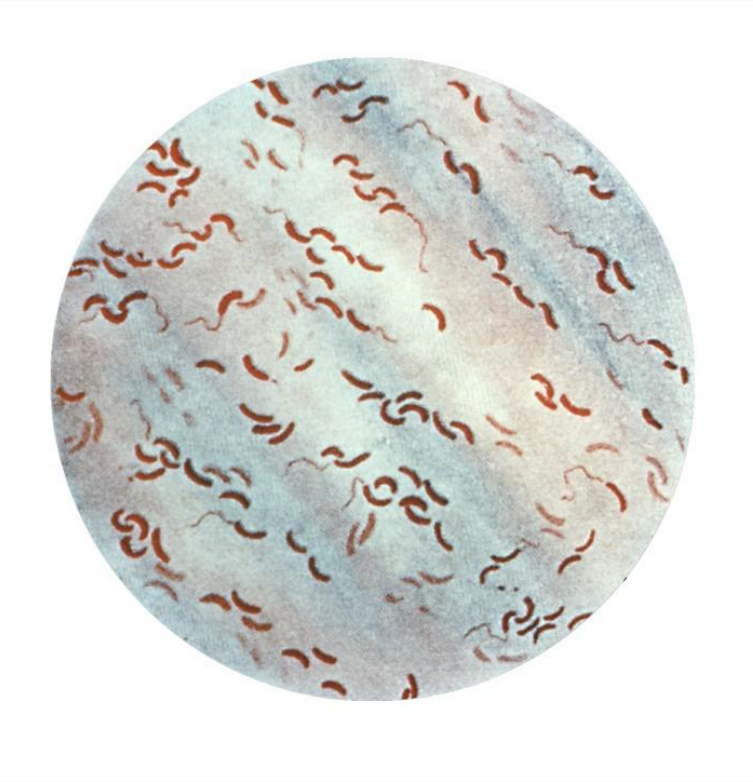
WHO: World Health Organization; CDC: Centers for Disease Control and Prevention; PHIL: Public Health Image Library

01 **Curved, Gram-negative bacillus.**

02 **Toxigenic O1 and O139 cause epidemic cholera.**

03 **O1 has caused all recent WHO-described outbreaks.**

04 **O1 biotypes: Classical and El Tor.**
Serotypes: Ogawa and Inaba.



Gram-stained Vibrio cholerae, CDC, PHIL 5324.

Source links and complete image credits are in the speaker notes.

Reservoirs and sources of infection

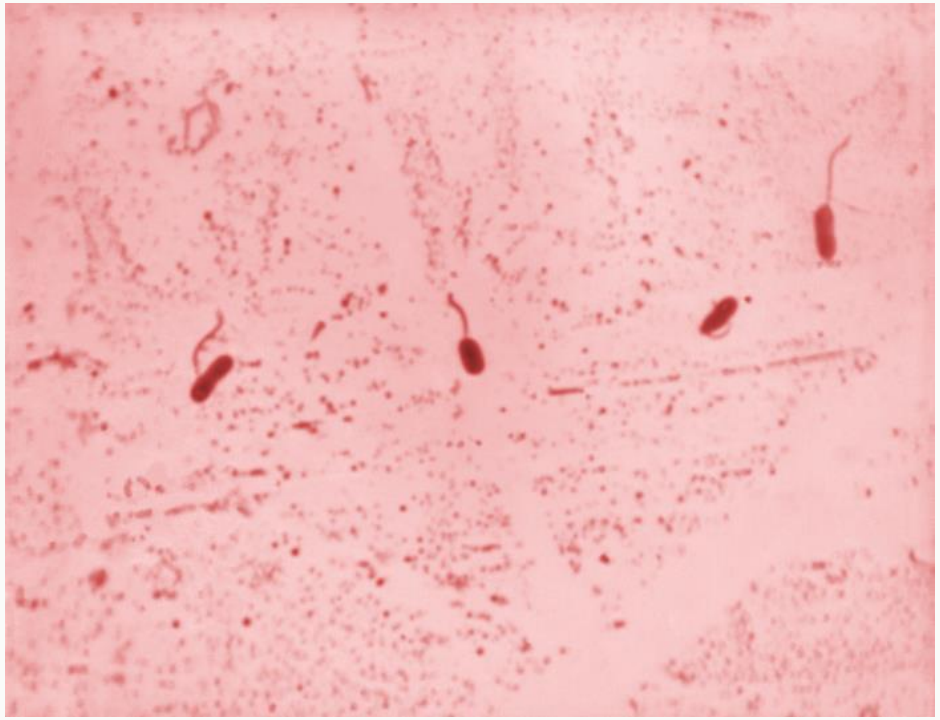
V.: Vibrio; CDC: Centers for Disease Control and Prevention; PHIL: Public Health Image Library

01 V. cholerae persists in aquatic environments.

02 Symptomatic and asymptomatic people shed bacteria.

03 Contaminated water and food transmit infection.

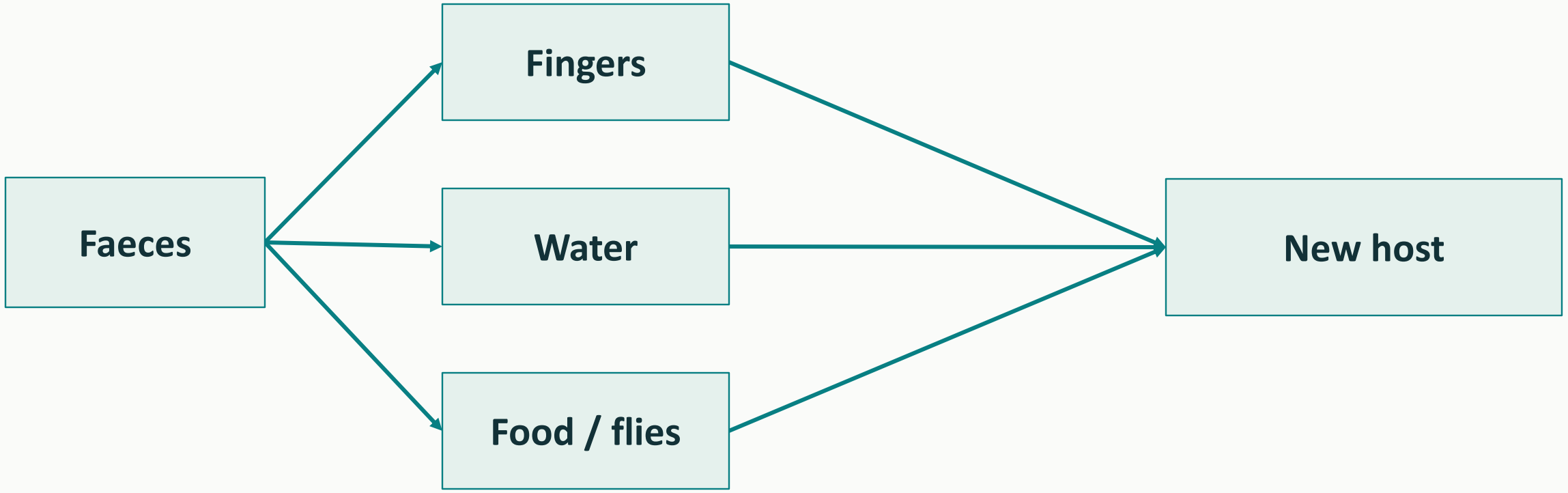
04 Unsafe storage can recontaminate treated water.



Flagellated Vibrio cholerae, CDC, PHIL 23062.

Source links and complete image credits are in the speaker notes.

Faecal–oral transmission and control points



SANITATION

HANDWASHING / SAFE WATER / FOOD SAFETY

Source links and complete image credits are in the speaker notes.

Who becomes exposed or severely ill?

UNICEF: United Nations Children's Fund; U.S.: United States; CDC: Centers for Disease Control and Prevention

01 **Exposure: unsafe water, poor sanitation, displacement.**

02 **Severe illness: low gastric acidity and malnutrition.**

03 **Closely assess infants, older adults and comorbid patients.**

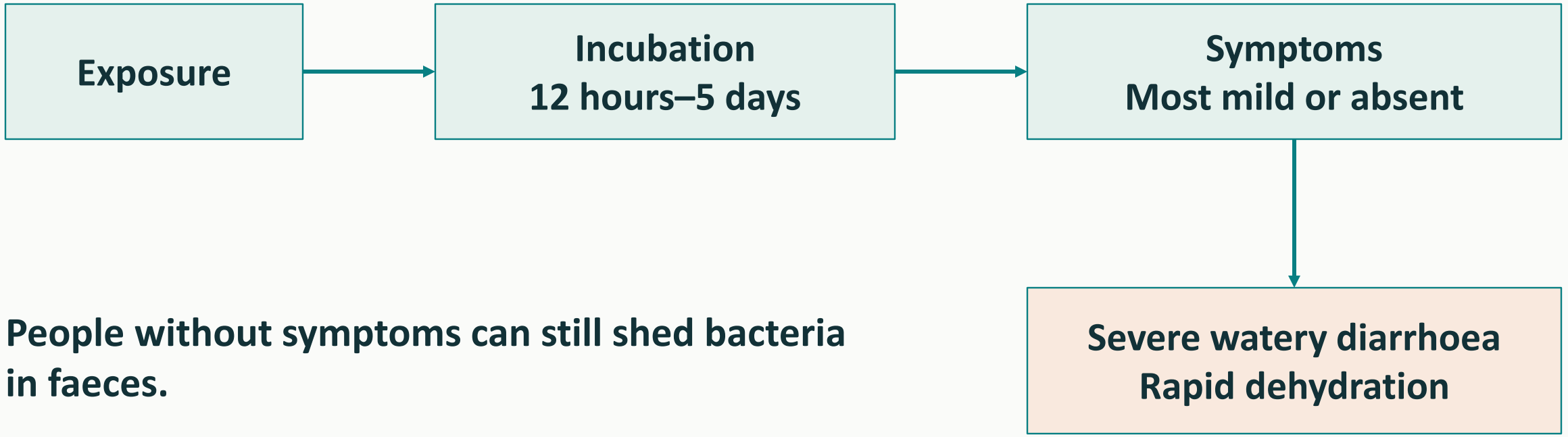
04 **Delayed rehydration increases the risk of death.**



Cholera care in Haiti. © UNICEF/U.S. CDC / Rouzier, UN0771611/UN0771609. Context photograph.

Source links and complete image credits are in the speaker notes.

Incubation and the infection spectrum



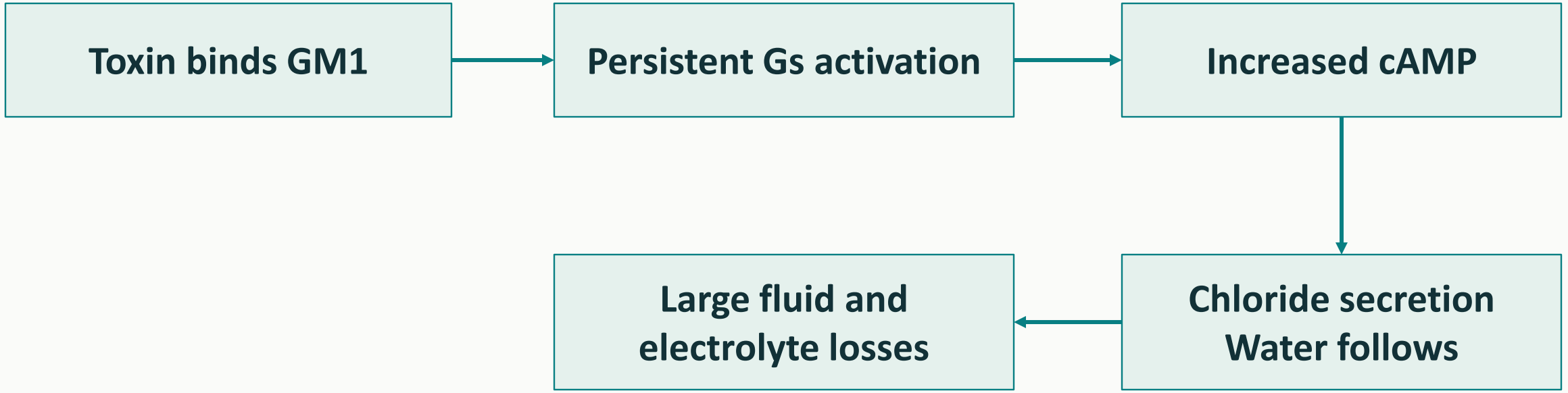
People without symptoms can still shed bacteria in faeces.

The interval from severe diarrhoea to shock may be only hours. Schematic, not to scale.

Source links and complete image credits are in the speaker notes.

Cholera toxin and secretory diarrhoea

GM1: monosialotetrahexosylganglioside; Gs: stimulatory guanine nucleotide-binding protein; cAMP: cyclic adenosine monophosphate; ORS: oral rehydration solution



ORS works because sodium–glucose cotransport remains functional.

Source links and complete image credits are in the speaker notes.

Clinical recognition

UNICEF: United Nations Children's Fund; U.S.: United States; CDC: Centers for Disease Control and Prevention

01 **Sudden, profuse, non-bloody watery diarrhoea.**

02 **Vomiting and cramps accompany fluid loss.**

03 **Rice-water stools may occur but are not required.**

04 **Oliguria, weak pulse or altered consciousness: danger.**



Child receiving cholera care in Haiti. © UNICEF/U.S. CDC / Rouzier, UN0771611/UN0771609.

Source links and complete image credits are in the speaker notes.

Dehydration assessment and treatment

IV: intravenous

Finding	Some dehydration	Severe dehydration
General state	Restless or irritable	Lethargic / unconscious
Eyes	Sunken	Sunken
Drinking	Thirsty, drinks eagerly	Unable to drink / drinks poorly
Skin pinch	Returns slowly	Returns very slowly
Initial plan	Plan B: oral rehydration	Plan C: urgent IV fluids

Assess the whole patient. A danger sign such as weak/absent pulse, respiratory distress or altered consciousness requires urgent action.

Source links and complete image credits are in the speaker notes.

Laboratory diagnosis and specimen pathway

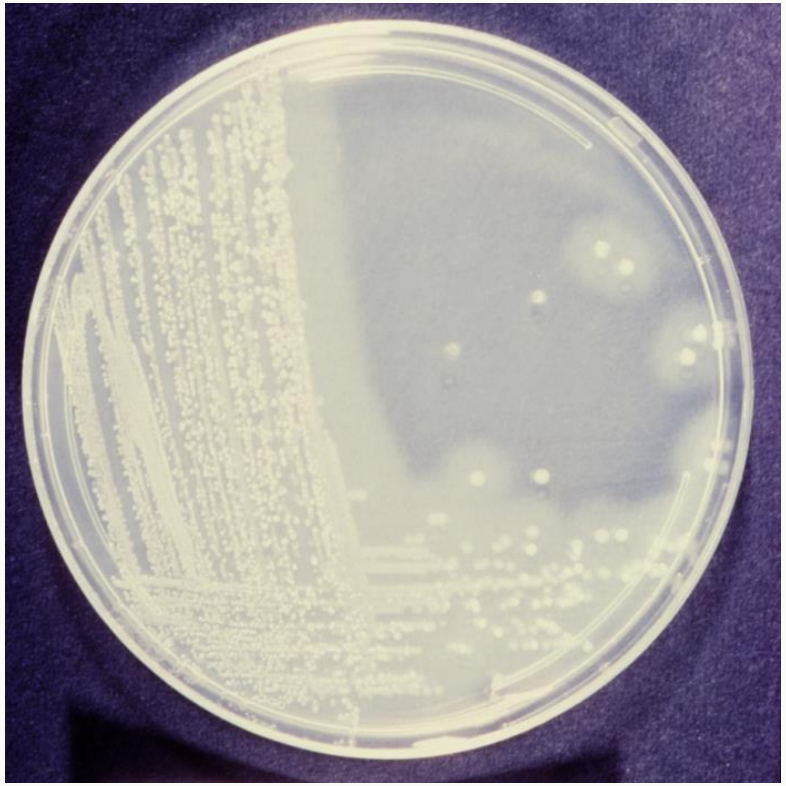
RDT: rapid diagnostic test; PCR: polymerase chain reaction; TCBS: thiosulfate–citrate–bile salts–sucrose; CDC: Centers for Disease Control and Prevention; PHIL: Public Health Image Library

01 Collect stool or rectal swab before antibiotics if feasible.

02 Cary–Blair medium supports specimen transport.

03 RDTs support early outbreak detection.

04 Culture with seroagglutination or PCR confirms O1/O139.



Historical gelatin agar identification medium, CDC, PHIL 3907. This is not a TCBS plate.

Source links and complete image credits are in the speaker notes.

WHO/GTFCC surveillance case definitions

WHO: World Health Organization; GTFCC: Global Task Force on Cholera Control; AWD: acute watery diarrhoea; PCR: polymerase chain reaction; V.: Vibrio

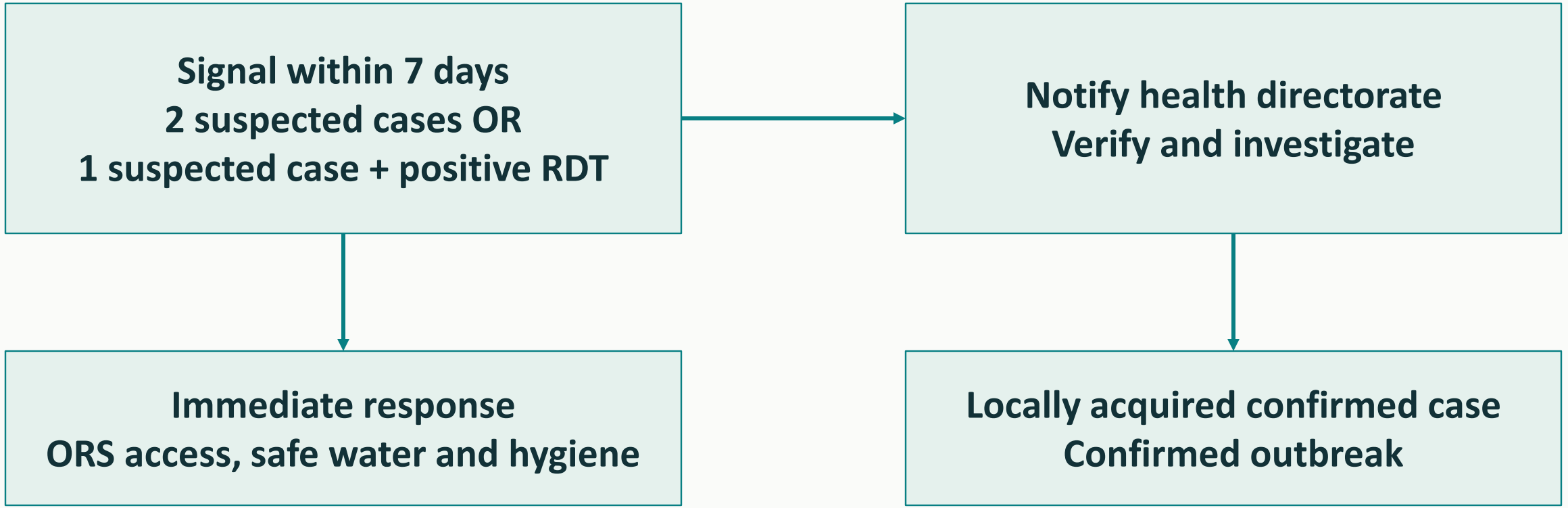
Surveillance setting	Suspected / confirmed case
No probable or confirmed outbreak	Age ≥2 years: AWD with severe dehydration, or death from AWD without another known cause
Probable or confirmed outbreak	Any age: AWD, or death from AWD
Confirmed, either setting	V. cholerae O1/O139 by culture with seroagglutination or PCR

AWD: ≥3 non-bloody liquid stools in 24 hours, with illness lasting <7 days.

Source links and complete image credits are in the speaker notes.

Outbreak alerts and notification

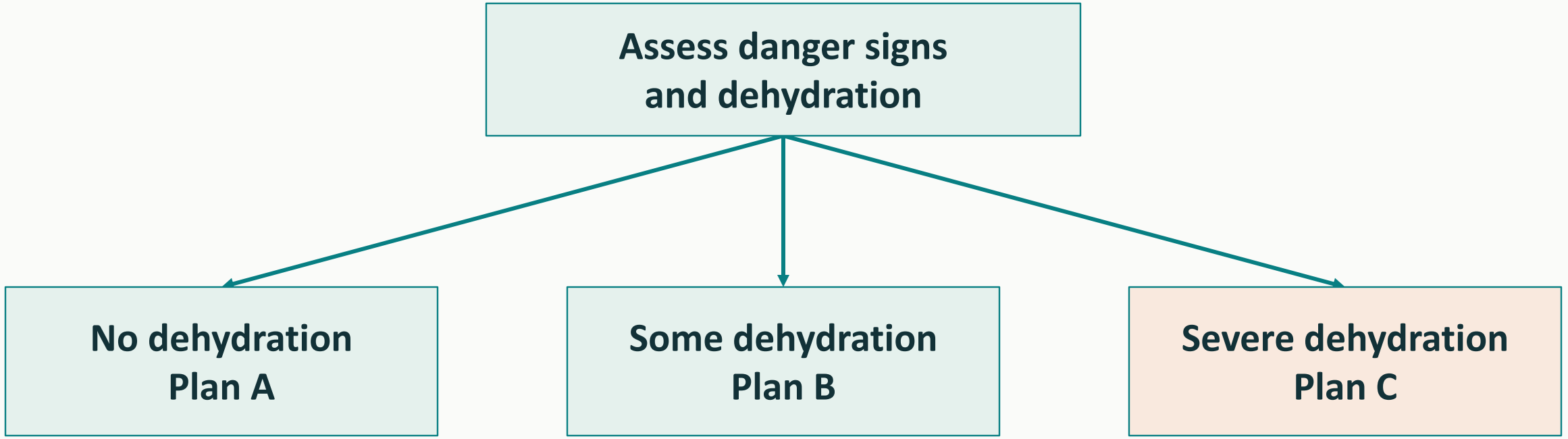
RDT: rapid diagnostic test; ORS: oral rehydration solution



Public health measures begin while laboratory confirmation proceeds.

Source links and complete image credits are in the speaker notes.

Initial management pathway



Reassess, record intake/output and replace ongoing losses. Testing runs alongside treatment.

Source links and complete image credits are in the speaker notes.

Oral rehydration solution

ORS: oral rehydration solution; CDC: Centers for Disease Control and Prevention; PHIL: Public Health Image Library

01 Use low-osmolarity ORS and the packet's water volume.

02 Mix with safe water. Add no extra sugar or salt.

03 Give frequent small sips. Slow after vomiting.

04 Continue breastfeeding and appropriate feeding.



Assisted oral rehydration, CDC, PHIL 5301. Historical clinical photograph.

If sachets are unavailable: 1 litre safe water + 6 level teaspoons sugar + ½ level teaspoon salt, while arranging care.

Source links and complete image credits are in the speaker notes.

Plans A and B: oral fluid replacement

ORS: oral rehydration solution; mL: millilitre; kg: kilogram; y: years; h: hours

Plan	Initial approach	Continuing care
A: no dehydration	ORS after each loose stool	<2 y: 50–100 mL 2–9 y: 100–200 mL ≥10 y: as much as wanted
B: some dehydration	75 mL/kg ORS over 4 hours	Add replacement of continuing stool/vomit losses and reassess
Example: 20 kg child, Plan B	20 × 75 = 1,500 mL / 4 h	This volume excludes ongoing losses

Deterioration, inability to drink or severe vomiting requires urgent reassessment and escalation.

Source links and complete image credits are in the speaker notes.

Cholera: rehydration Plans A, B and C

Choose the plan according to the degree of dehydration.

Plan / condition	Treatment	Purpose
A: NO dehydration	ORS after each loose stool. Continue feeding and breastfeeding; explain return signs.	Prevent dehydration
B: SOME dehydration	ORS 75 mL/kg over 4 hours under clinical supervision, PLUS replacement of ongoing losses.	Correct dehydration orally
C: SEVERE dehydration	Urgent IV fluids, preferably Ringer's lactate. Give ORS as soon as drinking is safe.	Restore circulation and hydration

Plan B example: 20 kg × 75 mL/kg = 1500 mL ORS over 4 hours, plus ongoing losses.

Plan C: 100 mL/kg IV initially, in two phases:

Age ≥1 year/adults: 30 mL/kg in 30 min, then 70 mL/kg in 2½ hours.
Infants <1 year: 30 mL/kg in 1 hour, then 70 mL/kg in 5 hours.

Reassess frequently, record intake/output and replace ongoing losses. Plan C requires urgent clinical care.

Source: GTFCC Cholera Outbreak Response Field Manual (2024), Section 7.

Plan C: severe dehydration

ORS: oral rehydration solution; mL: millilitre; kg: kilogram; min: minutes; h: hours

Ringer's lactate: 100 mL/kg total	First 30 mL/kg	Next 70 mL/kg
Age <1 year	Over 1 hour	Over 5 hours
Age ≥1 year and adults	Over 30 minutes	Over 2½ hours
Example: 60 kg adult	1,800 mL / 30 min	4,200 mL / 2½ h

Monitor perfusion frequently, replace continuing losses and add ORS when safe to drink. Adjust for clinical response.

Source links and complete image credits are in the speaker notes.

Adjuncts and common treatment errors

GTFCC: Global Task Force on Cholera Control; mg: milligram; CDC: Centers for Disease Control and Prevention; IV: intravenous

01 **Antibiotics support rehydration in selected patients.**

02 **Use current susceptibility results and local guidance.**

03 **GTFCC 2024 zinc: 20 mg/day, 10 days, age 6 months–5 years.**

04 **Avoid antimotility drugs and mass antibiotic prophylaxis.**

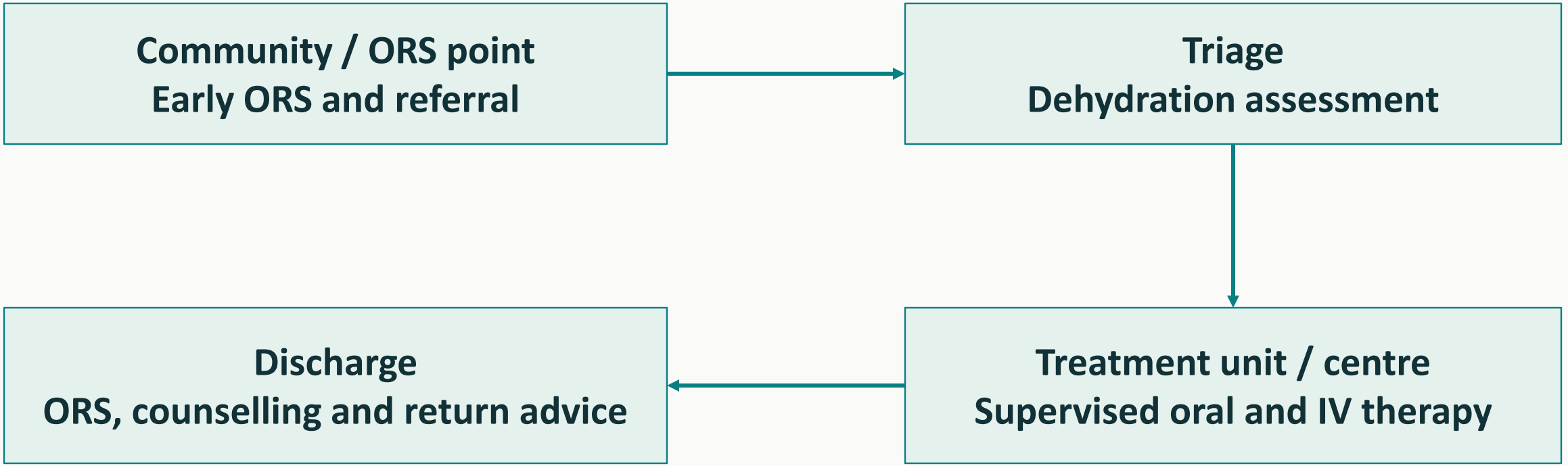


Healthcare provider checking an IV infusion. CDC treatment page. Context photograph.

Source links and complete image credits are in the speaker notes.

Cholera services and infection control

ORS: oral rehydration solution; IV: intravenous



Safe water, hand hygiene, toilets, cleaning and safe waste handling support every stage.

Source links and complete image credits are in the speaker notes.

Outbreak investigation in the field

CDC: Centers for Disease Control and Prevention; PHIL: Public Health Image Library

01 **Verify the signal and organize the response.**

02 **Create a case definition and line list.**

03 **Describe onset date, place and person.**

04 **Investigate water/food exposures. Begin control immediately.**



Historical cholera research and nutrition survey, Bangladesh, 1974. CDC, PHIL 17656.

Source links and complete image credits are in the speaker notes.

Example cholera line list: who, where and when

FICTIONAL RECORDS • Each row = one patient; each column = one variable.

Case ID	Age / sex	Residence	Symptom onset	Symptoms
CH-001	32 / F	Sector A	10 Nov, 06:00	Watery diarrhoea; vomiting
CH-002	8 / M	Sector A	10 Nov, 11:00	Watery diarrhoea
CH-003	61 / M	Sector B	11 Nov, 03:00	Watery diarrhoea; severe dehydration
CH-004	24 / F	Sector A	11 Nov, 09:00	Watery diarrhoea; vomiting
CH-005	45 / M	Sector C	12 Nov, 14:00	Watery diarrhoea

Age and sex describe PERSON; residence describes PLACE; onset describes TIME.

The same patients: exposures, tests and outcomes

Use the case ID to connect all information about the same patient.

Case ID	Suspected exposure	Stool sample / result	Treatment / outcome
CH-001	Well A	S-001 / pending	ORS; recovering
CH-002	Well A	Not collected	ORS; recovered
CH-003	Well A	S-003 / toxigenic V. cholerae O1 detected	IV fluids + ORS; admitted
CH-004	Well A and street food	S-004 / pending	ORS; recovering
CH-005	Water source unknown	S-005 / pending	ORS; recovering

ORS = oral rehydration solution. Update results and outcomes as information arrives.

How to organize the information

1. Assign one unique case ID to each patient; avoid duplicate records.

2. Keep one row per patient and a separate column for each variable.

3. Record symptom-onset date and time; use consistent formats.

4. Use “unknown”, “not collected” and “pending” accurately; they mean different things.

5. Add report date, dehydration class, case class and exposure dates to the full working record.

6. Keep names and contact details in a separate, securely linked register.

Note: Unknown We do not know the information Patient cannot remember which water source they used

Student exercise: interpret the line list

QUESTION: What pattern do you notice?

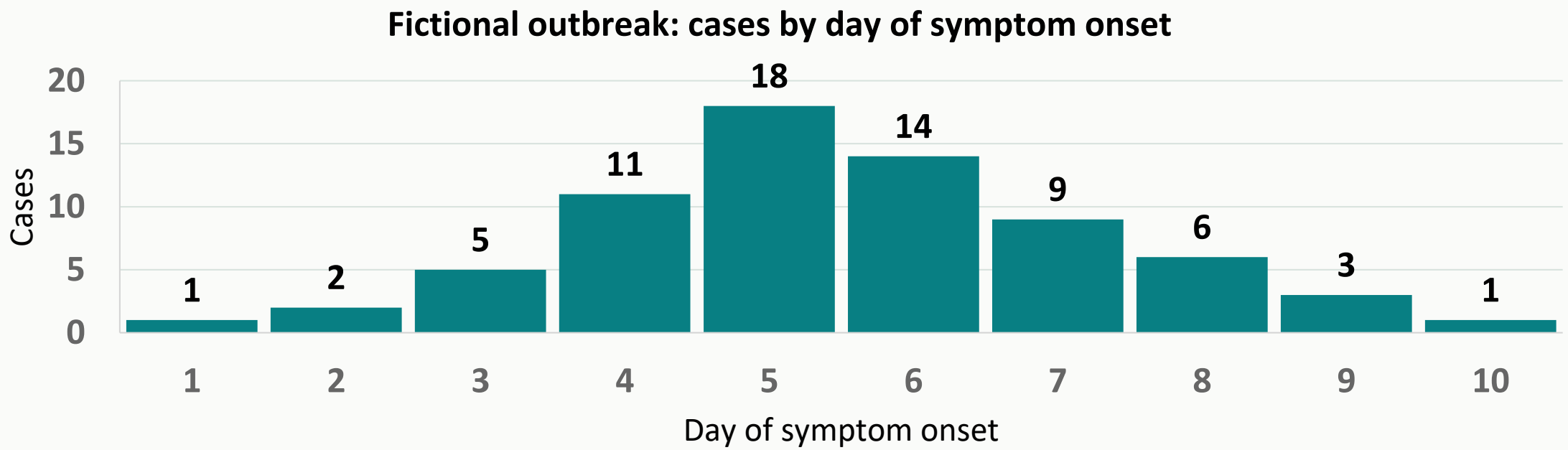
Several patients reported using Well A. This suggests a possible common exposure.

Does this prove that Well A caused the outbreak? NO.

Investigate water quality and exposure timing. Compare exposures with people from the same population who did not become ill.

A line list describes cases and generates hypotheses; further investigation tests them.

Descriptive epidemiology: an epidemic curve



Synthetic teaching data. An epidemic curve suggests hypotheses but cannot prove the water source.

Source links and complete image credits are in the speaker notes.

Analytic exercise: is tanker water associated?

Fictional exposure group	Ill	Not ill	Total	Attack rate
Drank tanker water	40	60	100	40%
Did not drink tanker water	10	90	100	10%

Risk ratio = (40/100) ÷ (10/100) = 4.0. What else is needed before a causal conclusion?

Source links and complete image credits are in the speaker notes.

Indicators for monitoring the response

CFR: case fatality ratio

Indicator	Calculation	Interpretation
Attack rate	Cases / population at risk × 100	Risk during a defined period
Case fatality ratio	Deaths among cases / cases × 100	Care access, severity and ascertainment
Example: 200 cases, 2 deaths	2 / 200 × 100 = 1%	Investigate each death
Treatment-centre benchmark	CFR <1%	Separate facility and community deaths

Source links and complete image credits are in the speaker notes.

Safe water: source to household

CDC: Centers for Disease Control and Prevention; PHIL: Public Health Image Library

01 **Protect water sources and repair sewage intrusion.**

02 **Use a validated local water-treatment method.**

03 **Boil water at a rolling boil for 1 minute.**

04 **Store in clean, covered containers.**



Bleach distribution for cholera prevention in Haiti. CDC, PHIL 18296. Not a dosing illustration.

Chlorine dose depends on product strength, turbidity and local water-quality targets. Follow validated instructions.

Source links and complete image credits are in the speaker notes.

Sanitation, hygiene and safe food

CDC: Centers for Disease Control and Prevention; PHIL: Public Health Image Library

01 Safe faeces disposal protects water sources.

02 Wash with soap after toileting and before food preparation.

03 Cook food thoroughly and eat it hot.

04 Use safe care, laundry and funeral practices.



Handwashing with soap. CDC / Amanda Mills, PHIL 13532.

Source links and complete image credits are in the speaker notes.

Oral cholera vaccines

OCV: oral cholera vaccine; WASH: water, sanitation and hygiene; UNICEF: United Nations Children's Fund; U.S.: United States; CDC: Centers for Disease Control and Prevention

01 **OCV complements WASH and treatment.**

02 **Stockpile vaccines: Euvichol-Plus / Euvichol-S.**

03 **Two doses provide longer protection.**

04 **One dose offers shorter outbreak protection.**

05 **Safe during pregnancy. Follow campaign policy.**



Cholera vaccination in Haiti. © UNICEF/U.S. CDC / Rouzier.

Iraq used OCV during the 2015 outbreak to protect displaced populations.

Source links and complete image credits are in the speaker notes.

Prevention priorities for Iraqi communities

ORS: oral rehydration solution

Community need	Public health action
Unsafe or interrupted water supply	Water-quality surveillance and rapid repair
Delayed access to care	ORS points, referral routes and stocked facilities
Unrecognized clusters	Facility and community alerts linked to laboratories
Household exposure	Safe water storage, sanitation and tailored communication
High-risk populations	Risk-based vaccination and preparedness planning

Source links and complete image credits are in the speaker notes.

Case discussion and key messages

Case 1: clinical action

The 22-year-old is lethargic and has a weak pulse. Which treatment plan is appropriate, and what must happen immediately?

Case 2: community action

Two suspected cases occur in one surveillance unit within seven days. What reporting and control actions are justified before culture results?

Key actions: assess dehydration, replace losses, notify early and interrupt faecal–oral transmission.

Source links and complete image credits are in the speaker notes.

Core references and textbook reading

WHO: World Health Organization; GTFCC: Global Task Force on Cholera Control

01 Park K. Park's Textbook of Preventive and Social Medicine. Banarsidas Bhanot. Cholera section, epidemiology of communicable diseases.

02 WHO. Cholera fact sheet and Cholera Annual Report 2025, published 2026.

03 GTFCC. Public Health Surveillance for Cholera, 2024.

04 GTFCC. Cholera Outbreak Response Field Manual, 2024.

Park is the main reading and organizing framework. Edition and page references require the course's assigned copy.

Source links and complete image credits are in the speaker notes.

Iraqi sources and visual credits

01 Iraqi Ministry of Health: disease surveillance dashboard and cholera training curriculum.

02 Iraqi Central Public Health Laboratory and regional health authorities: June 2022 data via the World Health Organization.

03 World Health Organization regional and annual reports supply national outbreak figures for 2022, 2024 and 2025.

04 Real photographs: public health image archives and clinical collections. Full credits and web links are in the speaker notes.

Data cut-off: complete-year 2025 where stated. Review date: 12 November 2026. No generated patient photographs.

Source links and complete image credits are in the speaker notes.