Safer Care Victoria

Critical Care Clinical Network

Standardised inotrope and vasopressor guidelines

Change package

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Contents

Introducing standard guidelines

Inotropes and vasopressors are vital medicines that are commonly used to treat the heart – mostly in our hospitals' intensive care units (ICUs) or critical care units (CCUs). As yet, there is no consistent practice in how these centrally-administered medicines are prepared, administered and dosed. This means we have significant variation across the state.

We aim to standardise how centrally administered inotropes and vasopressors are prepared, dosed and administered in Victorian ICUs and CCUs. In fact, by the end of 2019, we want to see 80 per cent of Victorian units using the standard guidelines.

A 2014 Australian and New Zealand Intensive Care Society (ANZICS) survey found seven different noradrenaline concentrations were being used in Australian and New Zealand ICUs[1]. In 2016, Safer Care Victoria's Critical Care Clinical Network scoped the concentration variation across nine commonly used inotropes and vasopressors. We found:

11 different infusion concentrations
were used for
3 vasopressor medications

16 different infusion concentrations
were used for
6 inotrope medications

Variability in preparing and recording doses has been a long-standing concern. The 2014 ANZICS survey found about 80 per cent of clinicians thought variation in noradrenaline concentration was a patient safety concern[1].

Standardised guidelines provide numerous benefits for both patients and staff.

Table 1: Benefits of standardised inotrope and vasopressor guidelines

Patients	Staff
Reduced medication errors	Timely access to up-to-date best practice guidelines
Seamless patient transition	Reduced staff training for those who work at multiple sites
	Reduced guidelines upkeep for updates

Helping you implement the guidelines

This package is designed to help you successfully implement the Safer Care Victoria (SCV) standard inotrope and vasopressor guidelines. It contains strategies and resources to help you manage change at your service.

While the guidelines have been designed for ICUs and CCUs, you may also want to implement them in other areas of your hospital that use vasoactive infusions. This may include anaesthetics, cardiology and the emergency department. However, we recommend you pilot the guidelines in your ICU or CCU first, as testing in one area increases the likelihood of success[2].

NEED HELP OR ADVICE?

Beyond this change package, our Critical Care Clinical Network is available to help you implement the guidelines and answer any questions you have.

Email: criticalcare.clinicalnetwork@safercare.vic.gov.au

Phone: 03 9096 7156

KEEP UPDATED

Please let us know if you're planning to implement the guidelines, and we will keep you updated on the latest information as statewide implementation progresses.

The SCV guidelines will be reviewed annually and updated as needed. We will communicate any updates to Victorian ICUs and CCUs through our enewsletter. Please subscribe at **bettersafercare.vic.gov.au/newsletter.**

If you have any feedback about the guidelines or this change package, please let us know.

Thank you

Thank you to the sites that piloted our guidelines in 2018: Adults Retrieval Victoria, Austin Health, Barwon Health, Epworth Eastern, Peninsula Health, South West Healthcare.

We would also like to thank the subcommittee who oversaw the pilot and statewide release of the guidelines: Melissa Ankravs, Kate Connelly, Rachel Fyfe, Stephanie Hunter, Tim Leong, Paul Ross and Lucy Sharrock.

Step-by-step implementation

Implementing the guidelines into your health service requires a structured approach. This section takes you through our recommended 10 steps, and useful resources provided in the package. It is likely to take you about six months to implement the guidelines in your ICU or CCU, and up to 12 months if you implement across your service.

The South West Healthcare experience

South West Healthcare (SWHC) has kindly shared its experience in implementing the guidelines across the Warrnambool and Camperdown campuses. Their content is provided in a break-out box under each step.

Table 2: High-level actions (by month)

Activity	1	2	3	4	5	6	7	8	9	10	11	12
1. Establish a case for change Find a motivating reason for implementing guidelines	●											
2. Establish governance and project team Identify your aims/measures by completing project plan*	●											
3. Recruit champions Extra staff on the floor who can help implementation	●											
4. Collect initial measures*		●										
5. Identify changes required to implement guidelines This will be done by completing a driver diagram*		●	●									
6. Identify tools and resources to support the changes These will be determined by your driver diagram results		●	●	●								
7. Develop a communication and education strategy So staff know when the change is coming and what it is			●	●								
8. Pilot the guidelines Initial testing (Plan-Do-Study-Act cycles)* Spread across the ICU				●	●	●						
9. Spread and sustain the changes Spread outside ICU Write project report						●	●	●	●	●	●	●
10. Ongoing evaluation Regular measurement to find out if you are still meeting your aim												● →

*Resources and templates can be found for these actions in the Resources section.

The 10 steps are adapted from Kotter's 8 Step Change Model[3].

1. ESTABLISH A CASE FOR CHANGE

Changing current practice can be challenging as it requires time and resources.

To help facilitate a change, you first need to establish a compelling reason. This could include evidence to identify the problem, how the change will benefit those involved, expected outcomes, etc.

This will help health service leaders, clinicians and other employees understand the importance of, and to engage with, the change project.

Resources

Standardised inotrope and vasopressor guidelines project summary

The South West Healthcare experience

SWHC took the following approach to establish a case for change:

Evidence of a problem: A sentinel event relating to peripheral inotropes had recently occurred.

Benefits of change may include:

- improved patient flow
- reduced staff training
- reduced medication errors
- improved patient safety.

Expected outcome: Standardisation of centrally and peripherally administered inotropes and vasopressors in SWHC.

2. ESTABLISH GOVERNANCE AND A PROJECT TEAM

Governance

Governance is critical for success and sustainability of guidelines implementation. It should be established early and linked with currently existing ICU/CCU structures at all levels – for example, medication safety and quality committees.

Consider the following:

- When do relevant governing bodies meet? (This will ensure the guidelines are ready for the required meeting)
- Who needs to sign off on the guidelines?
- Who should you report to about the project? (ICU director, director of medical services, etc.)

Please note: If you are planning to implement the guidelines across the health service, you will need to consider the governance processes in each clinical area and notify relevant clinicians in these areas.

Project team

The project team should be multidisciplinary, including all clinical areas involved in vasoactive infusions. For instance, the team could include:

- an ICU physician, nurse and pharmacist
- a quality advisor (if your health service has a quality department)
- an executive sponsor.

Project lead

A project lead should be chosen among the team members. Their role will be to collect measures and link with SCV.

When choosing the project lead, consider who is passionate about the topic and/or has experience in quality improvement initiatives.

Executive sponsor

The executive sponsor's role is to:

- liaise with other areas of the organisation
- serve as a link to senior management
- provide resources to the team
- ensure project accountability
- manage any large issues that may occur with the project.

Project plan

A detailed project plan will help guide successful implementation.

Our project plan template will help you:

- create a project aim
- determine measures to test the change
- identify change ideas that will result in successful guidelines implementation.

Resources


Project plan template and guide (page 17)

The South West Healthcare experience

Governance
A large part of the SWHC team's success was their extensive governance.

The project team reported into all relevant governance meetings, including: medication safety; policy and procedures; ICU; emergency department, and; quality.

Project team
The team included:

- ICU nurse unit manager (NUM)
- ICU assistant nurse unit manager (ANUM) x2
- ICU pharmacist
- ICU consultant
- executive sponsor.

Having a diverse team meant there was always a member who could influence the relevant stakeholders and key processes required for guideline implementation. For example, the pharmacist was essential for the guidelines and Guardrails being updated, while one of the ANUMs effectively engaged other nurses in the relevant education.

Project plan
SWHC stepped out how the service would have 100 per cent compliance with centrally and peripherally administered inotrope and vasopressor guidelines by pilot completion.

3. RECRUIT LOCAL CHAMPIONS

Strong senior leadership improves your success in adopting, testing and achieving continuous improvement from change projects.

Make sure you choose leaders with influence, who people trust and respect. Ensure you have senior ICU staff member (other than project team members) to champion your project – for example, ANUM, pharmacist, clinical nurse specialist, etc.

The South West Healthcare experience

SWHC recruited local champions from the ICU, theatres and emergency departments, including:

- all ICU ANUMs
- the director of anaesthetics
- the emergency department director and NUM at both campuses.

4. COLLECT INITIAL MEASURES

Prior to implementing the new guidelines, please collect baseline data to understand your current practice. This will help you identify whether a change has occurred.

We recommend collecting the following measures:

- Current inotrope and vasopressor guidelines: preparation and dosing.
- Smart pump programs that ensure safe medication delivery known as Guardrails, Mednet.
- Project progress score (change measure which can be found in Resources).
- Bedside practice, i.e. does the preparation and dosage at the bedside reflect the current guidelines?

As a project team, choose a timeframe to collect the measures e.g. two weeks. You can also determine a number target for each vasoactive you are collecting, for example five noradrenaline, two dobutamine etc.

Resources

 Smart pump program example (page 21)

 Project progress score (page 22)

 Bedside practice audit tool (page 23)

 **Bedside practice data entry tool**

The South West Healthcare experience

With help from other ICU ANUMs, the project team collected information on:

- current inotrope and vasopressor guidelines
- Alaris pump's Guardrails
- project progress score
- staff satisfaction with the guidelines.

SWHC also conducted a bedside practice audit, investigating whether preparation and dosing at the bedside reflected the current guidelines. This was done over a designated two-week period. The target for the bedside audit was to collect data on up to five patients on adrenaline, five on noradrenaline and two for the other vasoactive infusions.

5. IDENTIFY CHANGES REQUIRED TO IMPLEMENT GUIDELINES

To implement the guidelines, you will need to identify what changes need to occur.

To do this, you can use a driver diagram[4]. A driver diagram identifies the relationship between the aim, primary drivers, secondary drivers and change ideas. Change ideas are tested using Plan-Do-Study-Act (PDSA) cycles[5] (see page 13). Make sure you involve the whole project team to create your diagram, so all relevant drivers are identified.

Components of the driver diagram are:

- **Aim**: A goal describing the desired outcome. It should be specific, measurable and time bound.
- **Primary driver**: Factors that contribute directly to achieving the aim
- **Secondary driver**: Factors that contribute to the primary driver occurring
- **Change idea**: Specific change ideas that will achieve the secondary driver

Resources


Driver diagram template (page 24)


To learn more about driver diagrams, go to the **Institute for Healthcare Improvement (IHI) website**

The South West Healthcare experience

Aim	Primary driver	Secondary driver	Change ideas
100% compliance with SCV inotrope and vasopressor guidelines within six months of start date	Inotrope and vasopressor guidelines	Endorsed by health service governance to implement	Table guidelines for next medication safety, quality and policy and procedure meetings
			Seek to implement sign off
		Guidelines readily accessible by clinicians	Update current guidelines to reflect those published by SCV
			Upload guidelines on local guidelines/protocol platform, e.g. PROMPT
	Staff education	Understanding of changes involved	Laminated 'guidelines cheat sheets' at bedside
		Educators involved	Educators educate junior staff and organise all staff education sessions
		Usual staff education mechanisms	Education at staff huddles
	Communication of change with stakeholders/staff	Plan for targeting departments and staff	Staff newsletter, online hub
		Method for regular communication and updates	Staff huddles, governance meeting updates
	Guideline compliance	Pump/Alaris continuous quality improvement data	Review data
		Education capture data	Survey to identify number of staff who have been educated on the new guidelines
		Clinical practice aligns with guidelines	Bedside practice audit
	Planning for change	Change champions	Identify change champions. This should include executive and clinical leaders. Ensure correct people for each role
		Identify process of inotropes and vasopressor prescription, preparation and dosage	Map process
		Risk evaluation and identify risk reduction strategies	Tools that enforce the change, e.g. Guardrails, printed medication charts

6. IDENTIFY TOOLS AND RESOURCES TO SUPPORT THE CHANGES

After completing the driver diagram, you may need to update relevant tools and create new ones to support the identified changes.

For example:

- ensuring adherence to the new guidelines will require you to update smart pumps
- printed concentration infusion stickers and medication charts.

You may also need to source new tools to support the change. For example, sourcing 2 mg vials of noradrenaline to create the 6 mg/100 mL noradrenaline concentration

Pilot sites also found bedside reminders of the new guidelines helpful in re-enforcing the change. Example of these include guidelines lanyards, bedside guidelines summaries, pump reminders etc.

Resources

Printed medication chart (Barwon Health)

Bedside guidelines reminder (page 25)

Guidelines lanyards (page 26)

Pump reminder (page 27)

The South West Healthcare experience

Outlined below are some of the resources and tools SWHC used for implementation:

- Adapted old guidelines to reflect the preparation table of SCV's guidelines.
- Updated Alaris CQI.
- Created staff lanyards with new guidelines.
- Had bedside reminder on the pump to remind staff of new guidelines.

7. DEVELOP A COMMUNICATION AND EDUCATION STRATEGY

Educating staff about the new guidelines will be something all health services will need to identify in their driver diagram. This can be challenging, and you will need to use multiple methods to reach as many people as possible. Consider ways to incorporate your communication into current procedures and strategies – for example, via staff huddles.

Ensure you have a strategy to manage the 'resistors'. Resistance typically occurs from fear or a lack of understanding. You may need to talk to these people one-on-one if they are pivotal to the change occurring to manage their concerns.

Table 3: Suggested staff communication tools

Ok	Email	Newsletter
	Posters	Education/information sessions
Good	Huddles	Champions
Best practice	Governance	Multiple PDSAs (see page 13)
	Run charts (see page 15)	Policy

Resources

Educational presentation (South West Healthcare)

The South West Healthcare experience

SWHC used varied methods of communication to notify staff of the changes. Examples included:

- updates in the hospital newsletter
- clinician emails
- noticeboard updates
- in-service updates
- reporting to the ICU and emergency department directors.

8. PILOT THE GUIDELINES

Piloting the guidelines means testing them on a small scale – for example, trialling the new adrenaline concentration on one patient for one day. Testing the guidelines will involve undertaking Plan-Do-Study-Act (PDSA) cycles. PDSA cycles will be based on the change ideas derived from your driver diagram in Step 5. Choose the drivers which you believe will have the biggest impact to undertake a PDSA cycle on.

Plan	Choose the SCV inotrope drug guideline that requires changing. With a multi-disciplinary team, test and seek feedback
Do	Keep the scale of the initial test small. Begin with one patient, one nurse, one shift. Learnings from the first test are incorporated into subsequent tests and expanded to more staff and patients
Study	Observe and measure each test to understand impact. Note if anything occurred that was not expected.
Act	Decide if each test requires you to adopt, adapt or abort the approach. If successful, discuss and identify strategies for further spread to other departments or units

Numerous PDSA cycles will need to be completed to implement the guidelines into your ICU. Regularly seek feedback from stakeholders and document your PDSA cycles so you're aware of any issues that arise.

Post pilot data collection

Post pilot, you need to collect the same measures you collected initially – that is, guidelines, Guardrails, project progress scores and bedside practice. Post measures will identify whether your project aims were met and if the desired change occurred.

Resources

PDSA template (page 28)

To learn more on PDSA cycles, visit the **IHI website**

The South West Healthcare experience

Below is the PDSA cycle SWHC undertook prior to guideline implementation:

Testing medication guide at preparation site

Plan	Objective: To make the guidelines more accessible when preparing the infusion
Do	To increase guideline accessibility, a medication chart outlining the preparation was placed in the medication store room where the infusions were prepared
Study	Nursing staff who trialled the medication guide provided feedback on how useful it was for ensuring correct preparation when making the infusion
Act	Due to nursing feedback on the usefulness of the chart, it was also placed at the medical emergency team (MET) trolley

Practicalities of 'go live'

The guidelines were implemented across the ICU on a specified 'go live' date. Numerous testing as above was conducted prior to the date.

SWHC chose a time on the 'go live' day to launch the guidelines. It was decided the infusions that didn't align with the guidelines at this point in time would be ceased, and that a new infusion that matched the guidelines would be started.

Evaluation

Closer monitoring was required soon after implementing the guidelines to ensure they were being adhered to. There were frequent audits post implementation by the project team. For the first two weeks, nursing staff were advised to notify a project team member when there was a patient on a vasoactive infusion. This meant the patient's infusion could be audited.

After the guidelines had been implemented for a month, the same measures that were collected initially were collected again. This was over a two-week period which was the same timeframe as for pre data.

9. SPREAD AND SUSTAIN THE CHANGES

Once the guidelines have been piloted in your ICU and the change has been sustained, spread can begin to other areas. Spread will involve the same processes that were undertaken in the ICU (Steps 2 to 8).

Governance through embedding the guidelines into normal practice (Step 2) and recruiting local champions (Step 3) will be essential for effective spread. Ensure the infrastructure supports the change – for example, guidelines and smart pumps being updated hospital wide. This means the change is not reliant on one person. Lessons learnt from your pilot should be shared.

The South West Healthcare experience

Due to practicalities of all the smart pumps needing to be updated at once, the guidelines went live across the whole SWHC at the same time.

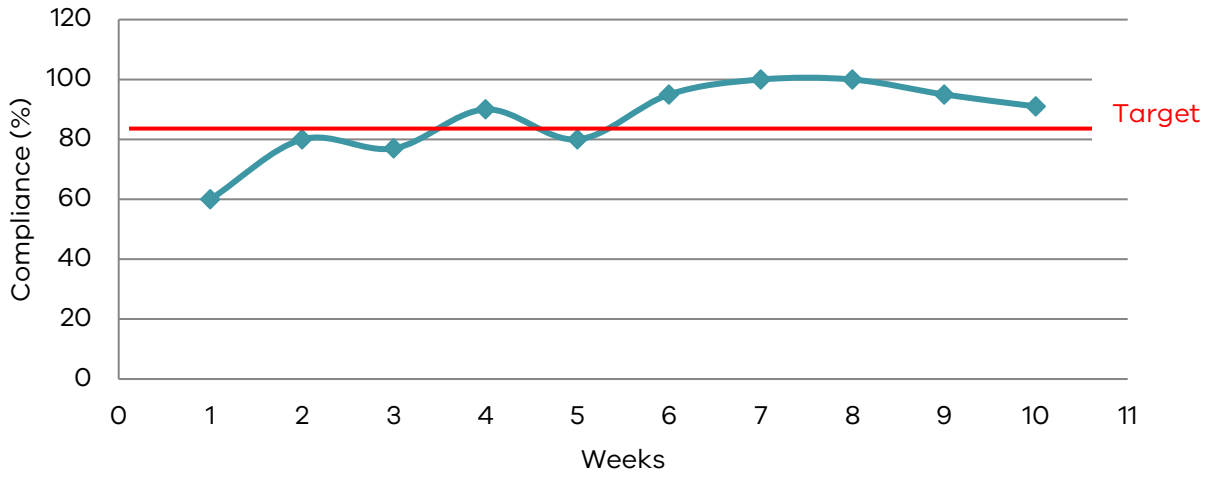
Each separate area where the guidelines were implemented undertook their own PDSA testing and evaluation. This was led by the champions in these areas.

10. ONGOING EVALUATION

Regular measurement is essential to identify whether the guidelines have been effectively implemented. It can also help identify any unintended consequences and provide lessons for future improvement. For instance, you may want to do a bedside audit on the first Monday of every month, and present results at relevant governance meetings.

Ongoing evaluation can be displayed on a run chart, on which you can mark your goal (e.g. 100% compliance), and dates when you made certain changes.

Figure 1: Suggested run chart to track guidelines compliance



Resources

 **Run chart template**

The South West Healthcare experience

SWHC plans to conduct:

- monthly audits on Alaris CQI – smart pump data identifies if staff have gone outside the provided medication parameters
- monthly bedside practice audits.

Resources

PROJECT PLAN TEMPLATE AND GUIDE

This template is designed to help you develop your local project plan for implementing the inotrope and vasopressor guidelines.

Project title			
Start date		**Finish date**	
Project co-lead (medical)		**Role**	
Project co-lead (nursing)		**Role**	
Project co-lead (pharmacy)		**Role**	
Executive sponsor			
Project progress score	Start:	Mid-cycle:	End:
ICU Director/NUM signature	**Signature**		
	Name		
	Date		

Project plan
1. What are you trying to accomplish? It is important you document what change you want to achieve. Ensure your aim is SMART (specific, measurable, achievable, results, time bound). For example: Change the ICU's inotrope and vasopressor guidelines to align with those published by SCV by December 2019.
2. Project objectives Clear, well-defined and achievable project objectives are critical to the success of your change project. This section should clearly document what you want to change and improve. The objectives will help form measures. For example: To update Guardrails to align with SCV guidelines.

3. Map the current process/practice/patient journey in your topic (consider stakeholders to involve)

In mapping out your process, consider which stakeholders to involve. This can help you identify any barriers to implementing the new guidelines.

See: **Process mapping the patient journey: an introduction**

Engaging with healthcare consumers

Under the Australian Charter of Healthcare Rights[6], patients, as well as carers and family, have a right to communicate or comment on their healthcare. Consider communication methods such as posters to engage consumers and their families about how you are changing your practice. We encourage this communication to occur at launch, but try to keep them updated on your progress.

4. Understand the practices to improve

List the specific changes you plan to undertake to implement the guidelines. Ensure the planned changes can be developed and implemented within the available project resources and timelines. Consider the sustainability of the proposed changes. The changes should be achievable and evidence-based.

For example: Embed the guidelines in our governance structure, conduct staff education sessions on the guidelines.

5. Develop, test and implement changes

Itemise the specific tasks required to implement the guidelines. Ensure you allow sufficient time for each step, including testing and implementation.

Testing change

Once a change has been developed it should be further refined by testing using the PDSA cycle. Testing on a small scale ensures time is not wasted on implementing a change that may not work in the long term. Testing also provides you with opportunity to assess any risks associated with the changes you are implementing. Risks to patients, clinicians, cost, resources and location should be assessed. Once you have identified the project risks, consider their severity, likelihood of arising and ways to manage them (e.g. using a risk assessment tool).

Implementing change

The change that is implemented is expected to become routine operations and will lead to an improvement that is able to be sustained. The change will require supporting processes such as developing relevant resources– for example, new pathway, policies and education and training.

See: **Institute for Healthcare Improvement: How to improve**

6. Sustain and refine local changes

How will you incorporate the new approach?

As the project progresses, make sure you review and monitor the impact of the changes and refine them as required in-line with the project objectives, timelines and resources. When reviewing the changes, make a note of whether the changes addressed other delays, faults, barriers, or gaps in the patient journey and identify any unintended outcomes.

Ongoing project success is based on the ability to sustain the changes. Embedding changes appropriate governance like departmental practices, policies and protocols etc. will help to sustain improved patient outcomes.

7. Staff engagement and communication plan (engaging ICU staff in the project for its duration)

Identify who your key stakeholders are early in the project, as they are significant to your success. Mostly they will be in the ICU but some may come from other areas of the hospital (e.g., the emergency department).

Keeping all key stakeholders well informed about the project is a challenge, especially in the complex ICU environment.

In previous years, successful communication strategies have included innovative posters, flyers, show bags and events, project updates at staff handovers and appropriate regular organisational forums.

Resource/output

8. Local project improvement team, roles, responsibilities and frequency of meeting

9. Project governance, monitoring and reporting (who does the project report to in ICU and frequency of reporting)

Developing a project plan that lists key activities, timelines and resources is a key part of ensuring the successful completion of the improvement project. The project will require regular monitoring of progress against the plan to keep the project on track.

Clear project governance and reporting lines in the ICU need to be established at the commencement of the project (e.g. to ICU director and NUM/quality meeting/leadership meeting).

SCV recommends the following personnel be engaged in the project: an executive sponsor, ICU director, ICU NUM, director of pharmacy, quality advisor and allocated project leads from ICU staff (medical, nursing and pharmacy). A clinical champion would give the project an added advantage.

10. Expected benefits for patients, staff and ICU

What is your aim short and long term?

The expected benefits to patients, staff and the department should be clear, realistic and measurable. You should be able to identify benefits to you and your ICU. Examples of potential benefits include, less variation of clinical practice, increased knowledge and compliance, standardised patient management, reduced staff training and reduced medication error.

11. Outcomes: process measures, patient and staff stories

How are you going to capture these throughout the project to illustrate improvement?

Ensure you choose measures that will reflect whether your project aim is being achieved.

For example: Medication error, staff satisfaction, bedside practice audit.

SMART PUMP DATA EXAMPLE

Drug name	Concentration (unit per ml)				Continuous infusion				Bolus					Bolus dose administration rate (per min)			
	Fixed	Limits															
		Hard min	Soft min	Soft max	Dosing units	Soft min	Soft max	Hard max	Dosing units	Soft min	Soft max	Hard max	Initial value	Soft min	Soft max	Hard max	Initial value
Noradrenaline	4 mg/66 mL	-	-	-	mcg/min	0.001	45	300	-	-	-	-	-	-	-	-	-
Levosimendan	12.5 mg/250 mL		-	-	mcg/min	1.6	24.1	30	mcg	120	1450	1800	-	12	145	180	-

PROJECT PROGRESS SCORE

Quality improvement project – progress score		
0.5	Intent to participate	Project has been identified, but the project plan has not been completed nor team formed
1.0	Charter and team established	A project plan has been completed and reviewed. Individuals or teams have been assigned, but no work has been accomplished
1.5	Planning for the project has begun	Organisation of project structure has begun (such as: what resources or other support will likely be needed, where will focus first, tools/materials needed gathered, meeting schedule developed)
2.0	Activity, but no changes	Initial cycles for team learning have begun (project planning, measurement, data collection, obtaining baseline data, study of processes, surveys, etc.)
2.5	Changes tested, but no improvement	Initial cycles for testing changes have begun. Most project goals have a measure established to track progress. Measures are graphically displayed with targets included
3.0	Modest improvement	Successful tests of changes have been completed for some components of the change package related to the team's charter. Some small scale implementation has been done. Anecdotal evidence of improvement exists. Expected results are 20% complete. See note 1
3.5	Improvement	Testing and implementation continues and additional improvement in project measures towards goals is seen
4.0	Significant improvement	Expected results achieved for major subsystems. Implementation (training, communication, etc.) has begun for the project. Project goals are 50% or more complete. See note 2
4.5	Sustainable improvement	Data on key measures begin to indicate sustainability of impact of changes implemented in system
5.0	Outstanding sustainable results	Implementation cycles have been completed and all project goals and expected results have been accomplished. Organisational changes have been made to accommodate improvements and to make the project changes permanent

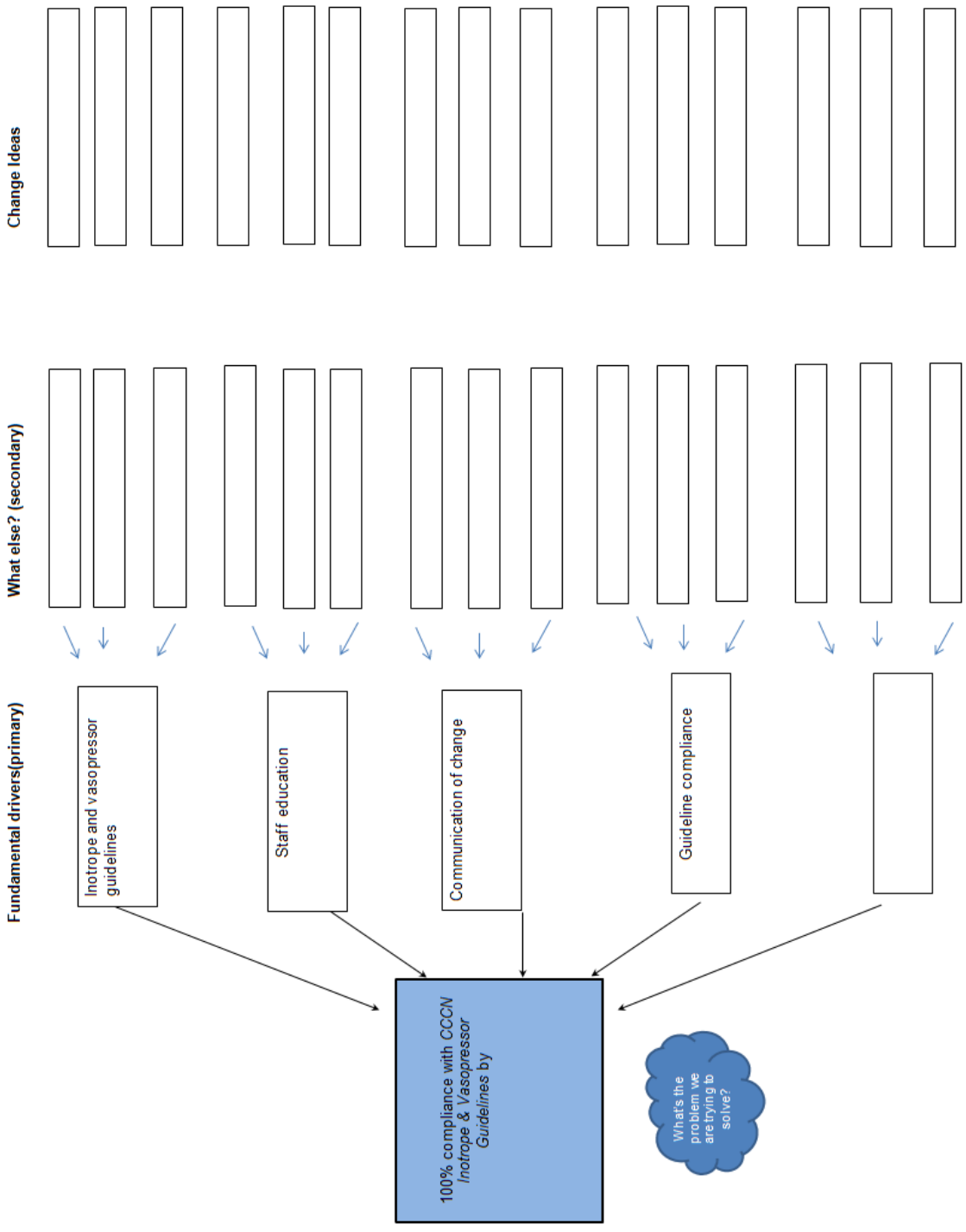
Note 1: This may mean either that a) 20% of project numeric goals have been met or b) each measure is showing 20% improvement towards goal.

Note 2: This may mean either that a) 50% of your numeric goals have been met or b) each measure is showing 50% improvement towards target.

BEDSIDE PRACTICE AUDIT TOOL

Date					
Infusion medication	☐ Adrenaline	☐ Dobutamine	☐ Dopamine		
	☐ Isoprenaline	☐ Levosimendan	☐ Metaraminol		
	☐ Milrinone	☐ Noradrenaline	☐ Vasopressin		
Preparation As recorded on current infusion bag/syringe	_____ in _____ Total dose		_____ ml of _____ Volume	_____ Fluid	
Medication dosage Current		mcg/min	mg/min		mL/hr (from pump/fluid balance chart)
		Other (specify units)	unit/hr		
Maximum in previous 24 hours i.e. end of 24hr period is when data collected		mcg/min	mg/min		mL/hr (from pump/fluid balance chart)
		Other (specify units)	unit/hr		
Minimum in previous 24 hours i.e. end of 24hr period is when data collected		mcg/min	mg/min		mL/hr (from pump/fluid balance chart)
		Other (specify units)	unit/hr		
The treatment goal of the medication is to	☐ Increase blood pressure		☐ Increase cardiac output		
	☐ Increase heart rate		☐ Other:		
How satisfied were you with the guidelines in providing you with the information you were looking for?	☐ 0 Did not use guidelines	☐ 1 Very dissatisfied	☐ 2 Dissatisfied	☐ 3 Neither satisfied or dissatisfied	☐ 4 Satisfied	☐ 5 Very satisfied
	Comments:					
Was there a variation in practice from the guidelines currently in use in the unit?	☐ Yes ☐ No					
	If yes, please provide a reason:					

DRIVER DIAGRAM TEMPLATE



BEDSIDE GUIDELINES REMINDER

Inotrope and vasopressor guidelines

Medication	Prescribe	Make infusion using	Volume to be removed from bag	Suggested dosing range
Adrenaline (epinephrine)	6 mg in 100 mL	100 mL bag glucose 5%	6 mL	Starting dose: 1–4 microg/minute
1 mg/1 mL vials (1:1000)	12 mg in 200 mL	250 mL bag glucose 5%	62 mL	Usual dose range: 1–20 microg/minute
Argipressin (vasopressin)	Via syringe driver: 20 units in 20 mL	Draw up 19 mL glucose 5%	N/A	Starting dose: 0.6 units/hour
20 units/1 mL vials	40 units in 40 mL	Draw up 38 mL glucose 5%	N/A	Usual dose range: 0.6–2.4 units/hour
Dobutamine	250 mg in 42 mL	50 mL bag glucose 5%	28 mL	Starting dose: 100–400 microg/minute
250 mg/20 mL vials	500 mg in 83 mL	100 mL bag glucose 5%	57 mL	Usual dose range: 100–1500 microg/minute
Dopamine	300 mg in 50 mL	50 mL bag glucose 5%	7.5 mL	Starting dose: 100–400 microg/minute
200 mg/5 mL vials	600 mg in 100 mL	100 mL bag glucose 5%	15 mL	Usual dose range: 100–1500 microg/minute
Isoprenaline 1 mg/5 mL vials	6 mg in 100 mL	100 mL bag glucose 5%	30 mL	Starting dose: 0.5–2 microg/minute Usual dose range: 2–10 microg/minute
Levosimendan 12.5 mg/5 mL vials	12.5 mg in 250 mL	250 mL bag glucose 5%	5 mL	Usual dose range: 0.05–0.2 microg/kg/minute
Metaraminol	Incremental IV bolus: 10 mg in 20 mL	Draw up 19 mL glucose 5%	N/A	Usual dose range: 0.5–10 mg/hour
10 mg/1 mL vials	Via syringe driver: 20 mg in 40 mL	Draw up 38 mL glucose 5%	N/A	
Milrinone	Via syringe driver: 10 mg in 50 mL	Draw up 40 mL glucose 5%	N/A	Starting dose: 0.1 microg/kg/minute
10 mg/10 mL vials	Via infusion pump: 20 mg in 100 mL	100 ml bag glucose 5%	20 mL	Usual dose range: 0.125–0.75 microgram/kg/minute
Noradrenaline (norepinephrine)	6 mg in 100 mL	100 mL bag glucose 5%	6 mL	Starting dose: 2–10 microg/minute
2 mg/2 mL vials	16 mg in 266 mL	250 mL bag glucose 5%	Nil	Usual dose range: 0.5-30 microg/minute

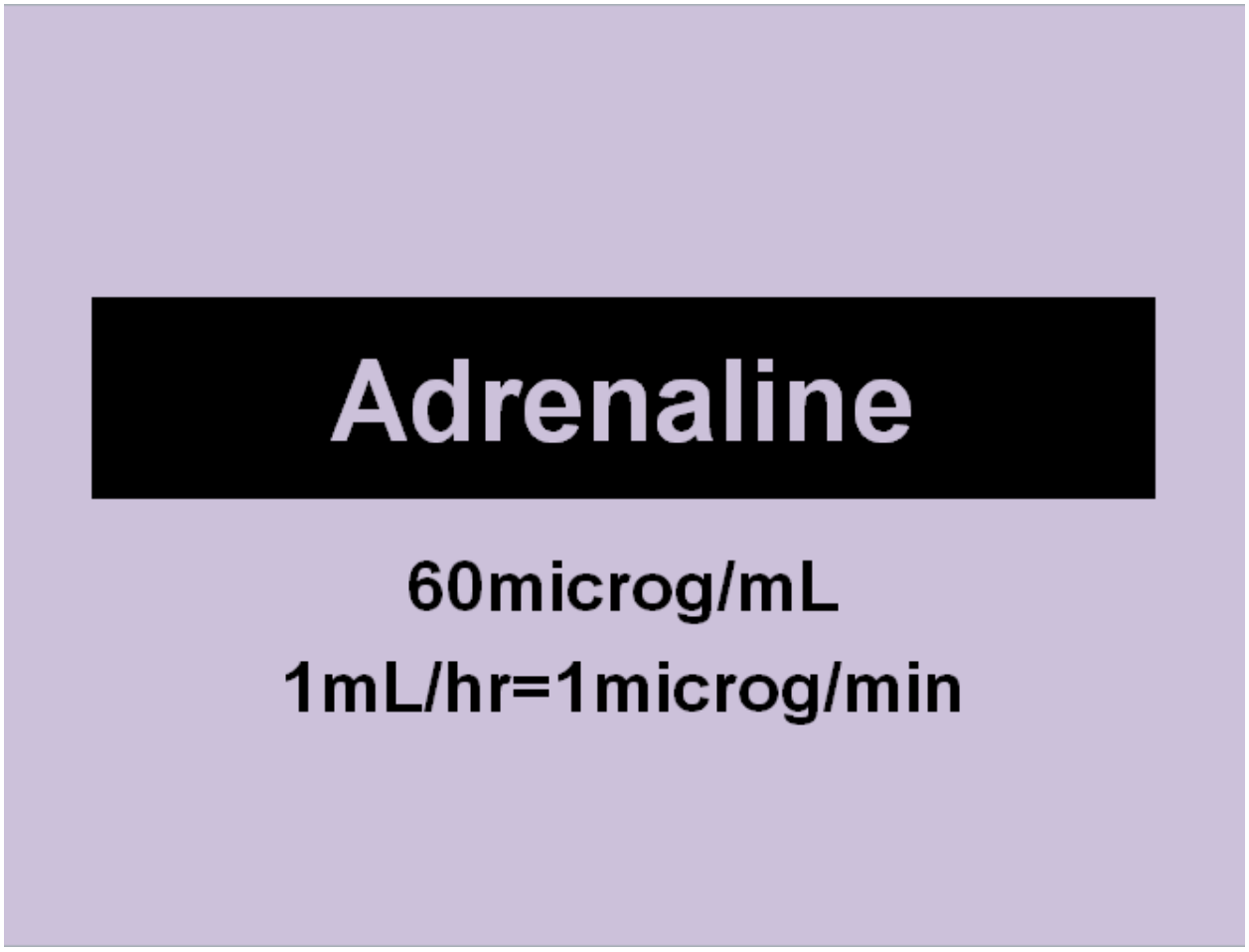
GUIDELINES LANYARDS

Medication and prescription (all made up in 5% glucose)	**Suggested dosing range**
Argipressin (vasopressin) Prescription via syringe driver: 20 units in 20 mL or 40 units in 40 mL	Starting dose: 0.6 units/hour Dose range: 0.6–2.4 units/hour
Metaraminol Prescription via syringe driver: 20 mg in 40 mL Via incremental IV bolus: 10 mg in 20 mL	Usual dose range: 0.5–10 mg/hour
Milrinone Prescription via syringe driver: 10 mg in 50 mL Via infusion pump: 20 mg in 100 mL	Starting dose: 0.1–0.2 micro/kg/minute Dose range: 0.125–0.75 micro/kg/minute
Noradrenaline (norepinephrine) Prescription via infusion pump: 6 mg in 100 mL or 16 mg in 266 mL	Starting dose: 2–10 micro/minute Dose range: 0.5–50 micro/minute

Medication and prescription (all made up in 5% glucose)	**Suggested dosing range**
Levosimendan Prescription: 12.5 mg in 250 mL	Dose range: 0.05–0.2 micro/kg/minute
Dobutamine Prescription: 250 mg in 42 mL or 500 mg in 83 mL	Starting dose: 100–400 micro/minute Dose range: 100–1500 micro/minute
Dopamine Prescription: 300 mg in 50 mL or 600 mg in 100 mL	Starting dose: 100–400 micro/minute Dose range: 100–1500 micro/minute
Isoprenaline Prescription: 6 mg in 100 mL	Starting dose: 0.5–2 micro/minute Dose range: 2–10 micro/minute
Adrenaline (epinephrine) Prescription: 6 mg in 100 mL or 12 mg in 200 mL	Starting dose: 1–4 micro/minute Dose range: 1–20 micro/minute

PUMP REMINDER

This is an example of a reminder that can be used as a sign at the bedside to remind clinicians of new medication concentrations and doses.



PLAN-DO-STUDY-ACT TEMPLATE

PDSA SERIES NAME

PDSA cycle number in series				
Start date		End date		
Objective for series:				
This PDSA cycle will:				
□ Collect information	□ Develop a change	□ Test a change	□ Implement a change	
Confidence:				
□ 1 Not confident	□ 2 Slightly confident	□ 3 Somewhat confident	□ 4 Confident	□ 5 Very confident

PLAN

What question(s) do you want to answer on this PDSA cycle?

Briefly describe what you want to achieve in this cycle of the series

What are we going to do?

How long will the test last?

Where will it be carried out?

Who will carry it out?

Task to be completed to undertake test	Who	When	Where and how

Prediction

What do you think will happen? Make a prediction for each question.

How will you collect the information and/or data needed for this cycle?

DO

Execute the plan

Record your observations and summarize the information and/or data collected. Include any problems or unexpected events encountered, and any feedback from the participants.

STUDY

Complete analysis of information and/or data

Compare the information and/or data collected to your predictions and summarise the learning

What does the information and/or data show?

Was your predication confirmed? If not what did you learn?

ACT

Decide the next steps

Following this test, you will:

□ Abandon idea □ Modify and retest □ Increase scale of testing □ Move to next cycle □ Implement

What is your plan for the next cycle?

References

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