



## Be competent, be safe

---

*There is no room for error with drug calculations.  
Develop and assess your skills with the world's  
leading resource for healthcare students and  
practitioners.*

# Introducing: safeMedicate

## Our Company

The safeMedicate® suite of medication dosage calculation problem-solving environments was launched in 2004 by UK based company Authentic World Ltd. Our mission is to improve patient safety by reducing medication error through high quality education and innovative software solutions.

Our safeMedicate® product and services portfolio is founded upon a series of innovative educational software applications derived from 25 years of PhD and post-doctorate translational research. All products are web-based and capable of standalone use or of seamless integration with existing learning management systems.

In 2016, safeMedicate® is used by higher education institutions and healthcare systems in 10 countries across five continents and is informing the competence development and assessment of over a quarter of million healthcare students and practitioners across the globe.



## Our Products

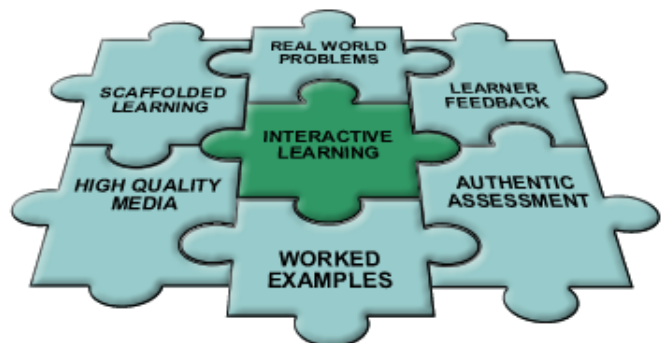
safeMedicate® learning environments aim to guide users through an experiential learning process that effectively bridges the gap between theory and practice.

Based upon constructivist theories of learning, this unique approach provides a platform for learning that is proven to be highly effective in assisting the development of key problem solving skills.

### Distinguishing Features

- **Exposure to real world problems** – presentation of authentic dosage calculation problems as they exist in real world environments
- **High quality media** - authentic visual representations of what learners will see and use in practice
- **Worked examples** - step-by-step walk-throughs that illustrate expert dosage calculation problem solving techniques that support a range of learning styles
- **Interactive learning** – use of immersive techniques that encourage active learner engagement with authentic features of clinical dosage calculation problems

- **Scaffolded learning** – use of innovative techniques that support the systematic construction of competence in dosage calculation
- **Authentic assessment** – diagnostic assessment of learner dosage calculation competence in a ‘real world’ context
- **Learner feedback** – evaluation of learner performance, measured against expert problem solving models that facilitates rapid diagnosis of competence and identification & correction of errors.



# Developing Competence



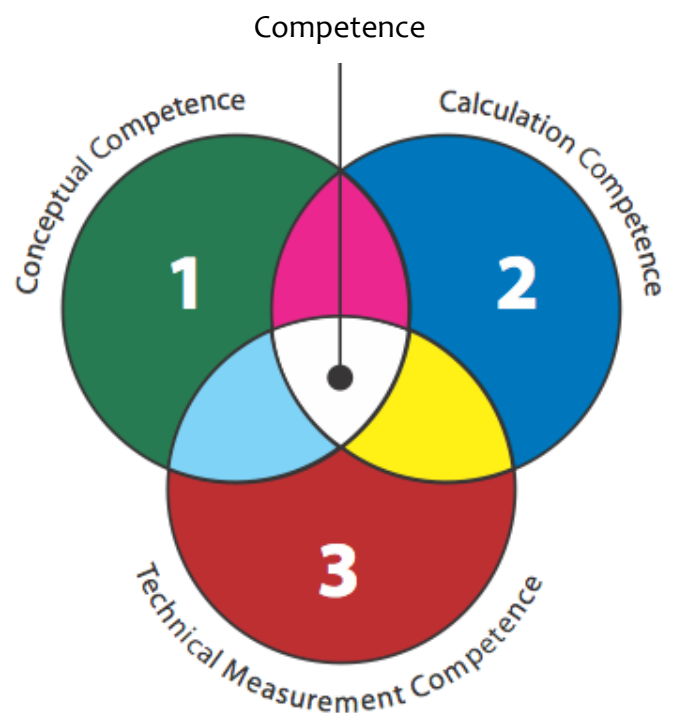
## The safeMedicate Competence Model

Every healthcare professional with responsibility for medication administration must develop, demonstrate and maintain competence within this domain of clinical practice.

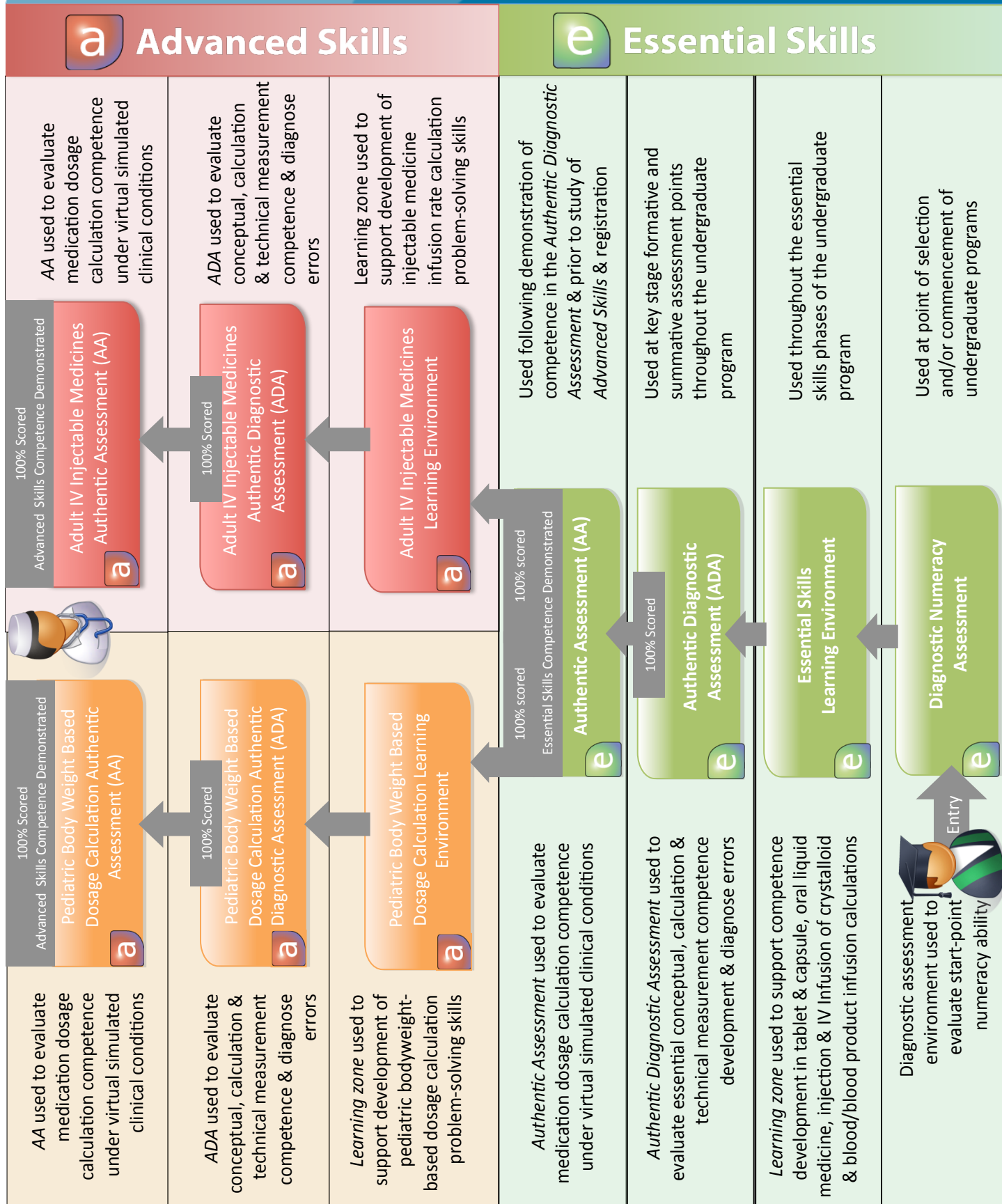
Competence in medication dosage calculation problem solving is dependent upon three interrelated sub-elements:

1. Conceptual competence – understanding the problem
2. Calculation competence – accurately calculating dosage and rate numerical values and measurement units
3. Technical measurement competence – transferring the numerical values to a medication measurement vehicle e.g. syringe or IV pump

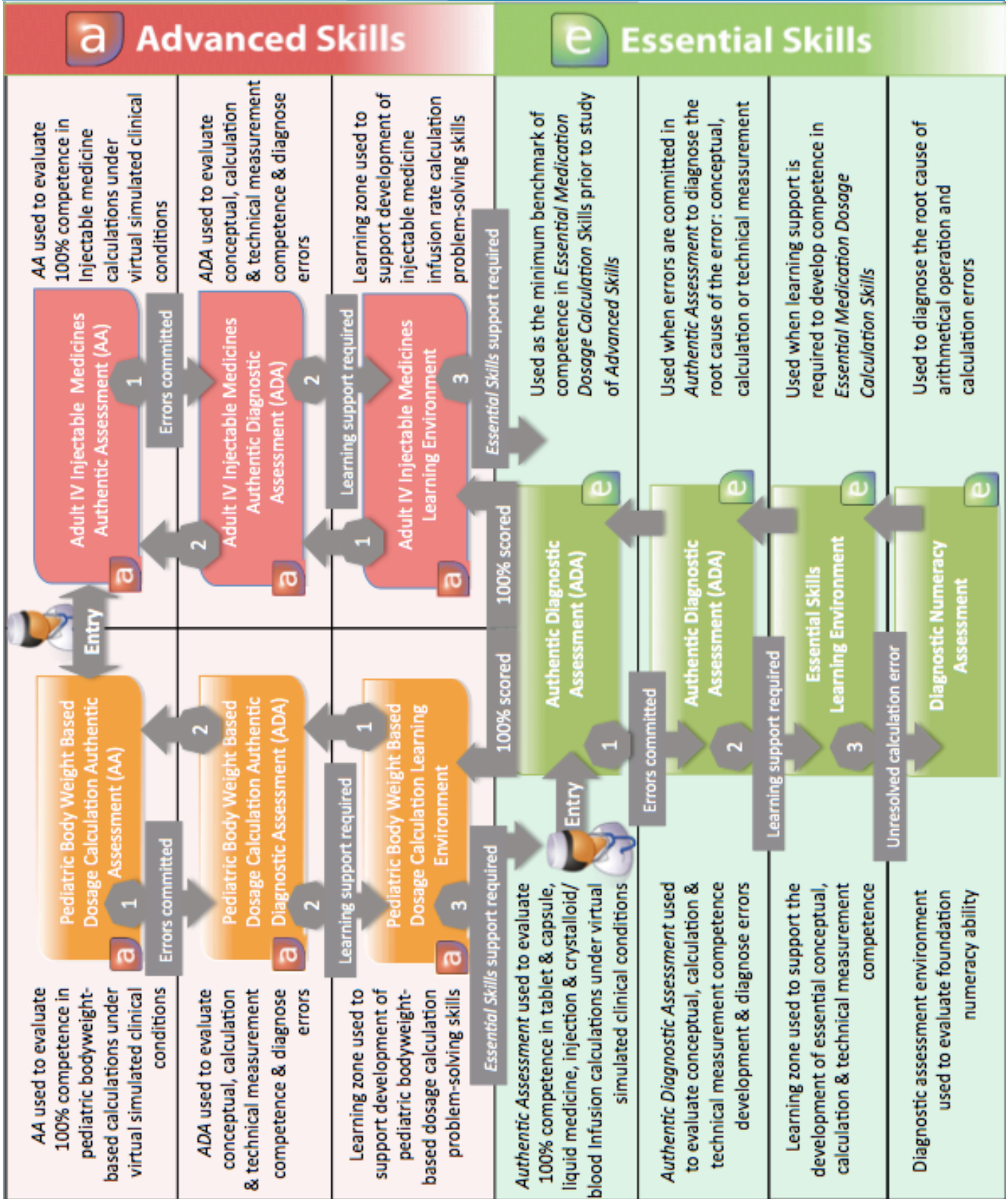
Our software provides a unique and innovative environment for developing and assessing cognitive competence (knowledge) in an authentic virtual clinical context. It also sensitizes and prepares the user for the general principles underpinning the functional competence (know-how and skills) requirements of dosage calculation problem solving in clinical practice.



# Typical Student Path Through safeMedicate Modules



# Typical Registered Practitioner Path Through safeMedicate Modules



# The safeMedicate Pathways

## The safeMedicate Student Path

The figure on page 4 illustrates the main components of our *safeMedicate* learning and assessment environment and outlines how healthcare students typically engage with each module.

For the student, the emphasis is on skills development and assessment in preparation for the role of registered healthcare professional. Our Essential Skills modules are designed to develop and assess the competencies required for safe medication dosage calculation at the point of registration and are compliant with the Essential Skills Cluster 33 requirements of the UK Nursing & Midwifery Council (NMC).

The Essential Skills learning environment sits at the heart of this learning process, whilst the associated assessment tools provide a structured and comprehensive platform for measuring cognitive competence in tablet and capsule, oral liquid medicine, injection and IV infusion medication dosage calculation skills required for safe medication administration at the point of registration and beyond.

Beyond registration requirements, the continuing professional development needs of practitioners are fully supported via our Advanced Skills *Pediatric Bodyweight-Based Calculation* and *Adult IV Injectable Medicines* learning and assessment environments, that focus on complex calculations associated with solving bodyweight-based dosing problems and infusion rates.

Finally, in recognition of healthcare systems that typically employ word-based problems as a component of pre-employment testing, we offer our *Word Problem Skills* module that supports and assesses understanding of how to solve these types of problems.

## The safeMedicate Practitioner Path

The figure on page 5 illustrates the main components of our *safeMedicate* learning and assessment environment and outlines how registered healthcare practitioners typically engage with each module.

For the registered practitioner, the emphasis at the Essential Skills Entry Point is on audit of the minimum benchmark of competence in tablet and capsule, oral liquid medicine, injection and IV infusion medication dosage calculation skills. If a practitioner achieves 100% on the Authentic Assessment, cognitive competence is demonstrated. Where competence deficits are identified, a detailed analysis of conceptual, calculation and technical measurement performance is made using our Authentic Diagnostic Assessment system. Where necessary subsequent remediation and competence development is facilitated within the *Essential Skills* learning environment.

At the Advanced Skills Entry Point, depending upon the needs of the practitioner, emphasis in *Advanced Skills* is on competence development and assessment in the domains of body weight based pediatric and/or intermittent and continuous Injectable Medicines infusion problems. If a practitioner achieves 100% on the Authentic Assessment, cognitive competence is demonstrated. Where competence deficits are identified, a detailed analysis of conceptual, calculation and technical measurement performance is made using our Authentic Diagnostic Assessment system. Where necessary subsequent remediation and competence development is facilitated within the *Advanced Skills* learning environment(s).



# Essential Skills

## Essential Skills Learning

*Essential Skills* is a highly interactive, visual and self-paced learning and assessment environment designed by experienced nurse educators and clinical pharmacists. It is designed to develop and assess the competencies required for safe medication dosage calculation at the point of registration.

*Essential Skills* can be used to replace traditional methods of teaching and assessing drug calculation skills and locates seamlessly within a typical pre-registration curriculum. The integrated assessment features provide a platform for formative or summative assessments with automated and detailed diagnostic feedback on performance for the individual user and institution.

*Essential Skills* is designed to assist learners to:

- Understand the essential clinical features of dosage and rate problems.
- Recall and develop the computation skills required to accurately calculate dosages and IV infusion rates.
- Develop the technical skills to accurately measure the dose or rate using typical administration vehicles.
- Practice at their own pace and continually assess and evaluate their learning and understanding

Students work through six sections that combine to support the development of cognitive competence in drug dosage calculation problem-solving and to sensitize them to the functional competence requirements of clinical practice.

1. Introduction
2. Prescriptions and SI Units
3. Tablets and Capsules
4. Liquid Medicines
5. Injections
6. IV Infusions

*Essential Skills* enables students to undertake practice assessments in each of the four medication domains. Medication problems are drawn randomly from a structured assessment rubric of increasing levels of complexity.

Setting up the Division Orientation

ROUTINELY SCHEDULED MEDICINES	DATE
Medicine Approved Name: -	21/07/2019
START DATE: 06:00	
ORDERED DOSE: 2mg	14:00
Dr Jones	22:00

2mg x 1 tablet = 1 tablet

Try the Calculation Yourself

See if you can identify which of the answers is correct and drag the correct measurement of medicine into the answer box.

ROUTINELY SCHEDULED MEDICINES	DATE
Medicine Approved Name: Amoxicillin	21/07/2019
START DATE: 06:00	
ORDERED DOSE: 250 mg Oral	14:00
Dr Jones	22:00

Amoxicillin 100mg/5mL

7.5mL  
5mL  
2.5mL

Division: 250 mg x 5 mL = 10mL

Division: 200 mg x 10 mL = 8 mL

Now use your chosen administration method to measure the calculated dose.

Stage 1 - Calculating mL/hr

1000 mL = 125 mL/hr

8 hour(s)



## Essential Skills Assessment

*Essential Skills* provides a number of assessment options for either formative or summative testing. All question sets are randomly generated with no two learners receiving the same mix of questions at the same sitting. However, all learners receive the same mix of problem complexity ensuring that there is parity across the group. Scoring and reporting is fully automated with release of results under the control of the organisation.

### Diagnostic Numeracy Assessment (DNA)

This module is designed to gauge the learner's start-point understanding of basic numeracy concepts and can be used pre or post selection of candidates. It consists of a 40-point assessment split into six sections that include Division; Multiplication; Conversion of fractions to decimals; Multiple Computations (integers); Multiple Computation (decimals) and Conversion of SI Units.

The problems are typical of the arithmetical operations and calculations that underpin medication dosage calculations. The assessment provides useful diagnostic feedback from the outset to pinpoint areas of strength and weakness to help guide and promote learning.

### Authentic Diagnostic Assessment (ADA)

ADA is designed to periodically assess the development of drug calculation competence and provide error diagnosis and feedback within conceptual, calculation and technical measurement domains. It does this by simulating the real world problems that students and practitioners will be exposed to in clinical practice and capturing each aspect of the problem solving process.

Detailed diagnostic feedback is provided to the learner and institution within the framework of the *safeMedicate Competence Model* ensuring that learning is always optimized.

### Authentic Assessment (AA)

With a design informed by a 3-year programme of research commissioned by NHS Education for Scotland (NES), *Authentic Assessment* takes one step closer again to the reality of medication dosage problem solving in practice. AA is used as a 'point of registration' summative assessment for learners and, in the UK, meets the requirements of the Nursing & Midwifery Council (NMC).

For registered practitioners, AA provides for pre-employment testing and periodic audit activities according to local need. Powerful reporting tools make it easy to swiftly and accurately verify drug calculation competencies and identify those staff requiring further training and support.

Remaining: 119 minutes Question 23 of 40

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40

**Multiple Computations**  
Use your calculation skills to solve the following problem

$$\frac{2}{25} \times 50$$

Choose an answer and click NEXT to continue.

0.4   4   0.04   0.25   DON'T KNOW

NEXT

**ROUTINELY SCHEDULED MEDICINES**

MEDICINE	START DATE	END DATE	ADMINISTRATION TIME
Carbamazepine	9/9/2015	9/9/2015	10:00

DOSE: 100 mg ROUTE: ORAL

DOCTOR'S SIGNATURE: Dr. Jones

Carbamazepine 100 mg in 5 mL

**DRAWING UP THE CORRECT VOLUME FOR ADMINISTRATION**  
Choose an appropriate syringe and draw up your calculated dose for administration. Click NEXT when you are ready to continue.

Rounding: For volumes greater than 1mL, round to tenths. For volumes less than 1mL, round to hundredths.

100 mg x 5 mL = 5 mL

Medicine Cup

0.5 mL, 1 mL, 2 mL, 5 mL, 10 mL, 20 mL

NEXT

**AS REQUIRED MEDICINES**

MEDICINE	START DATE	END DATE
Methadone Hydrochloride	9/9/2015	9/9/2015

DOSE: 5 mg ROUTE: I.M. FREQUENCY: -

DOCTOR'S SIGNATURE: Dr. Jones

Methadone Hydrochloride 10 mg in 1 mL

**CALCULATING THE REQUIRED DOSE FOR ADMINISTRATION**  
Using whichever method you are most comfortable with, calculate the required volume for administration and choose a suitable delivery method below with which to draw up the medication. Click NEXT to continue.

Rounding: For volumes greater than 4 tenths, round to tenths. For volumes less than 1mL, round to hundredths.

Medicine Cup

RESET   NEXT





# Advanced Skills

## Advanced Skills Learning

*Advanced Skills* is a highly interactive, visual and self-paced learning environment designed by experienced nurse educators and clinical pharmacists.

It is designed to develop and assess the competencies required for safe medication practice with the more complex problem solving and calculations associated with pediatric bodyweight-based problems and Adult IV injectable medicines therapies.

*Advanced Skills* provides everything required to support the continuing professional development needs of the registered practitioner.

## Pediatric Bodyweight-Based Dosage Calculations

This module is designed to assist learners to:

- Use the *Six Rights of Medication Administration* to deliver prescribed medications to an infant or child.
- Determine safe and therapeutic dosage ranges for the pediatric population.
- Calculate single and daily divided drug dosages based on the pediatric patient's body weight.
- Scrutinize medication orders and to identify errors in prescribed medication dosages.
- Demonstrate medication administration skills by selecting the correct syringe and measuring the correct volume of oral and injection medications.

## Injectable Medicines Therapies

This module will prepare health professionals for safe IV medication practice on general and specialist wards, high dependency and intensive care units.

Learners will use our unique authentic dimensional analysis system as the equation framework for solving injectable medicines calculations for intermittent and continuous infusions.



# a Advanced Skills

## Advanced Skills Assessment

The *Advanced Skills* assessment module provides a platform for institution-wide formative and summative assessments with detailed diagnostic feedback to the user and to the organisation.

All problems are authentic and are typical of the broad range of complexity seen in clinical practice settings.

For pediatric bodyweight-based problems, assessments feature both single dose and divided dose problems.

1  
STEP 2  
STEP 3  
STEP 4

AS REQUIRED MEDICINES			
MEDICINE Approved Name	START DATE		
Phenytoin Sodium	9/2/2015		
DOSE	ROUTE	FREQUENCY	
356 mg	IV	-	
DOCTOR'S SIGNATURE: Dr. Jones			

Phenytoin Sodium  
50 mg in 1 mL

Well Done! You have successfully completed the calculation and administered the correct dose.

39.16 lbs × 2.2 conv. = 17.8 kg

17.8 kg × 20 mg/kg = 356 mg

356 mg × 1 mL = 7.1 mL

50 mg

For IV injectable medicines therapies, the problem solving process provides a comprehensive assessment of cognitive competence that includes a range of safety checks, equation setup and calculation and the accurate setting of rate of administration and volume of IV infusions.

Depending on the needs of the practitioner or organisation, assessments can feature both modes of administration (intermittent and continuous infusions) or focus only on one mode typical to the area in which the practitioner normally works. This means that users will not have to jump through unnecessary hoops by being subjected to problems they will likely not see in day-to-day practice.

Question 1 of 10

The Doctor has ordered a Continuous Infusion. Level 1

Set the pump at the Patient's Bedside to your calculated administration rate and administer the medication.

Rounding: When required, mL/hr must be rounded to tenths.

DOSE FORMULA	PREPARED	PRODUCTS	ANSWER
0.5 mg × 50 mL	= 25 mL	25 mL	2.5 mL/hr
hr × 10 mg	= 10 hr	10 hr	

QUESTION 1 - You answered this question CORRECTLY

CONTINUE

WEIGHT: 50 kg

VOLUME: 50 mL

DOSE: 10 mg

10 mg Nimodipine in 50 mL 5% Dextrose

Medication Datasheet: Dose: 0.5 mg - 2 mg every 1 hr

For this patient administer at 0.5 mg/hr

CORRECT ANSWER

DOSE FORMULA	PREPARED	PRODUCTS	ANSWER
0.5 mg × 50 mL	= 25 mL	25 mL	2.5 mL/hr
hr × 10 mg	= 10 hr	10 hr	

SETTING THE PUMP

YOUR ANSWER

DOSE FORMULA	PREPARED	PRODUCTS	ANSWER
0.5 mg × 50 mL	= 25 mL	25 mL	2.5 mL/hr
hr × 10 mg	= 10 hr	10 hr	

YOU INDICATED THAT THE PRESCRIBED DOSE, PATIENT & MEDICATION DETAILS ARE ACCURATE

THE PATIENT IDENTITY BRACELET WAS CHECKED BEFORE ADMINISTRATION

SETTING THE PUMP

# W Word Problem Skills

## Word Problem Skills

The *Word Problem Skills* module has been designed to support learners to undertake word-based dosage calculation problems that are typical of North American licensure type examinations such as NCLEX and are also commonly used for pre-employment testing purposes.

Word problem formats include multiple-choice questions and fill in the blank/gap type questions as illustrated in the examples on this page.

Video Feedback associated with each of these problem types assist learners to:

- identify the important elements of the word problem required for undertaking the calculation
- understand the relationship between those elements and the real life clinical objects such as prescriptions/medication orders and medication containers etc.
- set up an equation and accurately calculate the answer to the word problem.

QUESTION 3 - You answered this question CORRECTLY

The healthcare provider prescribes Aminophylline 168mg oral solution by mouth for an adult patient with acute severe asthma. The label on the solution reads Aminophylline 105mg/5mL.

To administer the correct dose, how may mL should the nurse give?

4      3.1      **8**      8.4

Correct Answer

$168 / 105 = 5 \cdot 8$

QUESTION 3 - You answered this question CORRECTLY

ROUTINELY SCHEDULED MEDICINES			DATE
MEDICINE (preferred name)	START DATE	STOP DATE	COMPLETION TIME
Aminophylline	0600		
168 mg Oral		1900	
DOCTOR'S SIGNATURE	2200		
Dr. Jones			

Aminophylline 105 mg in 5mL

The healthcare provider prescribes Aminophylline 168mg oral solution by mouth for an adult patient with acute severe asthma. The label on the solution reads Aminophylline 105mg/5mL. To administer the correct dose, how may mL should the nurse give?

$\frac{168 \text{ mg}}{105 \text{ mg}} \times 5 \text{ mL} = 8 \text{ mL}$

REPORT 132 lbs

400mg Dopamine in 250mL 5% Dextrose

Administer at 2 mcg/kg/min

The nurse has an order to administer Dopamine at 2mcg/kg/min for a patient admitted to the cardiac intensive care unit with cardiogenic shock. The pharmacy prepares a solution of 400mg/250 mL 5% Dextrose Intravenous Solution. The patient weighs 132 pounds. How many mL per hour should the nurse set the volumetric pump at?

Round your answer to the nearest one tenth of a mL/hour.

DOSE FORMULA	PATIENT WEIGHT	BL UNIT CONV	PREPARED	TIME CONV	BL UNIT CONV	PRODUCTS	ANSWER
$2 \frac{\text{mcg}}{\text{kg} \cdot \text{min}}$	$132 \text{ lbs}$	$1 \frac{\text{kg}}{2.2 \text{ lbs}}$	$400 \frac{\text{mg}}{250 \text{ mL}}$	$60 \frac{\text{min}}{\text{hr}}$	$1 \frac{\text{mg}}{1000 \text{ mcg}}$	$250000 \frac{\text{mg} \cdot \text{hr}}{\text{mL} \cdot \text{min}}$	$4.5 \frac{\text{mL}}{\text{hr}}$

QUESTION 30 - You answered this question CORRECTLY

The nurse has an order to administer Dopamine at 2 mcg/kg/min for a patient admitted to the cardiac intensive care unit with cardiogenic shock. The pharmacy prepares a solution of 400mg/250mL 5% Dextrose Intravenous Solution. The patient weighs 132 pounds (lbs).

How many mL per hour should the nurse set the volumetric pump at?

Round your answer to the nearest one tenth of a mL/hour.

Your Answer **4.5** mL/hr

# Licence Costs & Purchase Options

## Higher Education Pricing

Duration/Module	Essential Skills	Essential Skills + Pediatric Bodyweight Based Calculations	Essential Skills + Injectable Medicine Therapies	Essential Skills + Pediatric Bodyweight Based Calculations + Injectable Medicine Therapies
6 months	£6.00	£7.00	£7.00	£8.00
1 Year	£10.00	£12.00	£12.00	£13.00
2 Years	£15.00	£18.00	£18.00	£21.00
3 Years	£20.00	£25.00	£25.00	£28.00

All prices are exclusive of VAT and come into effect 1<sup>st</sup> September 2016.

For higher education institutions, we provide access to a range of module combinations across the suite of *safeMedicate* **Essential Skills** and **Advanced Skills** modules as 6-month, 1-year, 2-year or 3-year options.

The **Essential Skills** module provides a learning and assessment platform that is congruent with the *NMC Essential Skills Cluster for Medicines Management* and meets the requirements for dosage calculation competence at the point of registration.

Should you wish to expose your students to the more complex calculations associated with either of our **Advanced Skills** modules then you can choose to include either or both to meet the needs of your curriculum.

Licences are typically purchased in bulk by the institution according to total student numbers on the course. Licences are issued on receipt of an official purchase order from the institution. All licences will be associated with the purchasing institution for student administration purposes.

On first implementation of *safeMedicate* at a particular higher education institution, if purchasing 3-year licences in bulk for 1<sup>st</sup> year students beginning their undergraduate studies, we are pleased to offer discounted prices for existing 2<sup>nd</sup> year and 3<sup>rd</sup> year students. Further details can be provided at time of purchase.

# Licence Costs & Purchase Options

## Healthcare System Pricing

Duration/Module	Essential Skills + Pediatric Bodyweight Based Calculations + Injectable Medicine Therapies
6 months	£8.00
1 Year	£13.00

All prices are exclusive of VAT and come into effect 1<sup>st</sup> September 2016.

For healthcare organisations, we provide access to the entire suite of *safeMedicate* **Essential Skills** and **Advanced Skills** modules as a 6-month or 1-year option.

Licences are typically purchased in bulk by the institution according to total user numbers required. Licences are issued on receipt of an official purchase order from the institution. All licences will be associated with the purchasing institution for user administration purposes.

### **safeMedicate Administrator Licence Costs**

There is no cost associated with administrator licences for faculty or healthcare system managers, or for access to our Administrative Portal (see below) when the institution purchases student or practitioner licences in bulk.

*safeMedicate* **Customer Support** is also provided to the institution at no additional cost.

### **safeMedicate Administrative Portal**

The Administrative Portal provides faculty and healthcare system managers with a platform for managing *safeMedicate* within the institution. Features and functionality include:

- Assessment scheduling
- Fully automated assessment generation, marking and feedback provision
- Student/practitioner engagement and performance monitoring tools
- Powerful reporting and data export facilities

# Training Workshop & Webinars



Our safeMedicate Training Workshop and Webinars are designed specifically to help you get the most out of the software and to support its successful implementation within your organization. They are for staff that will take responsibility for its local administration, supporting learners and monitoring their engagement and performance.

Workshops are delivered using a blend of seminar type presentation, discussion and hands-on computer training. Our professional trainers will come to your organization to deliver the workshop which typically lasts a full day.

Alternatively, our interactive workshops/webinars are typically delivered online by our professional e-learning specialists and comprise a blend of slide presentation, discussion and live product demonstration.

## Workshop/Webinar Schedule

- Introduction to the materials and underlying educational approach
- Competence in medication dosage calculation
- Overview of *safeMedicate* software suite
  - Content and scope
  - Key features and functionality
  - Interpretation and optimization of learner performance
  - Administrative tools
  - Assessment types, scheduling and reporting
- Curriculum integration (higher education users)
- Strategies for successful organization-wide implementation
- Workshop/webinar evaluation



## Access and Security

Authentic World offers higher education institutions and healthcare providers with the definitive online solution for developing, assessing and maintaining the essential and advanced skills that underpin competence within the domain of safe medication dosage calculation.

All of our products are web-based and our website is available 24 hours a day and 365 days a year from anywhere in the world providing you have access to the internet via a network or reliable broadband connection. All that is required to run our software is an up-to-date web browser such as Google Chrome, Microsoft Internet Explorer or Mozilla Firefox. Our user guides are also online in PDF format and require the Adobe Reader software to view them. Adobe Reader is a free download.

Access to all our software is via our secure website portal providing encryption of the highest standard thereby offering the utmost level of security possible. This means you can rest assured that communications between your browser and our site are private and secure.

Please visit our website at [www.safemedicate.com](http://www.safemedicate.com) for more information. You'll find everything you need to know about our company, the features of our safeMedicate software and our safeMedicate Interactive Demo (SID), that allows you to engage with and undertake example diagnostic assessments from our entire suite of **safeMedicate** environments.

## Safety in Numbers

The design, development and international evaluation of the **safeMedicate** suite of programs is informed by a 25-year programme of translational research. In 2013, Elsevier reported the history and evidence underpinning **safeMedicate**, in an eight-paper *Safety in Numbers* virtual special issue of *Nurse Education in Practice*. The series is available online at [www.nurseeducationinpractice.com/content/safety](http://www.nurseeducationinpractice.com/content/safety).

Please get in touch for further details via our email, website or telephone contact details listed below.

### Authentic World Ltd

Unit 25 Cardiff Medicentre  
Heath Park, Cardiff CF14 4UJ

Tel: 00 44 (0) 29 2076 2936  
Email: [info@authenticworld.co.uk](mailto:info@authenticworld.co.uk)  
[www.authenticworld.co.uk](http://www.authenticworld.co.uk)  
[www.safemedicate.com](http://www.safemedicate.com) | [www.safemedicate.net](http://www.safemedicate.net)

