MESSAGE from Ken Grauer, MD (ekgpress@mac.com)

Welcome to ECG Competency! These few pages will illustrate how to login to the site – and – How to get to the ECG Exams.

- Go to: http://www.ecgcompetency.com/ - which is our HOME PAGE. It should look like the picture below:

Welcome to my web site on ECG Competency! In addition to this HOME page – there are 3 key Sections

- ABOUT – Provides information about what the ECG Competency web site is (as well as information
- CONTACT (Admin) – You will be asked to Log In by providing your Username and Password
  can request an e-mail reminder of your password if you forget it. Access to the ECG Practice
The colored MENU BAR at the top of the page provides easy linking to HOME – ABOUT – CONTACT (Admin) – and the ECG EXAMs.

- Basic introductory information (including useful links) – can be found under the “HOME” and “ABOUT” menus.

- The “CONTACT” link will take you to “My Account” (logout; your password – which you can change) – as well as a link to report any problems you might experience.

- Click on the ECG EXAM menu. Your screen should now look like the picture on the next page:

**NOTE:** It may take a moment for this site to load the tests when you first start up! Please be patient. Uploading tests becomes quicker after you’re “in” and have gotten started.

- Please contact me (info@ecgcompetency.com) – IF you continue to encounter excessively slow loading times.
After clicking on the **ECG EXAM** menu – Your screen should now look like this:

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**Online ECG Competency Exams**

We have developed **3 Practice Exams** and **4 REAL Exams** for use by subscribers to ECG Competency.

- IF you have already subscribed – you should have been assigned a user name and password.
- IF you forget your password – you can request an e-mail reminder.
- IF you would like to subscribe – See BOX to the right for info.
- Click [HERE](#) for **Instructions** for Taking and Scoring the Exams.

**Copyright Notice**

All questions and images are copyright © by KG-EKG Press and may not be used for any purpose except for practice, study and taking the tests on this website.

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**ABOUT the Exam**

The figures and questions on the Practice and Real Exams have been developed by Dr. Ken Grauer with the goal of representing an assessment of the essential areas of clinical ECG interpretation by primary care clinician. The following is a list of the major **Content Categories** that are tested:

- **Rate & Rhythm** (including recognition of sinus mechanism rhythms; normal variant)

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Click on the purple “I agree, take me to the Exams” link.
You’ll now be asked to **Log In**:

- Enter your username (= *the e-mail address you used when signing up for ECG Competency*) – and your Password.
- You can ask the site to “*Remember me*” on the computer you are using to facilitate login next time.
- Note that the system will prompt you IF you forget your password.

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**ECG Competency Exam**

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**Log In**

Passwords must be kept confidential and not shared with others.

Through the use of your password, you are being given access to a restricted area copy any information or share this section of the website with others.

**Please log in to go to that page**

Username: 
Password: 

[✓] Remember me next time.

[ I Agree, Log In ]

Register to Get a Password

Forgot My Password
Once you have logged in – your screen should look like the picture below:

- Note that there are 3 Practice Exams – and – 4 Real Exams (Additional exams may be added in the future).
- Practice Exams – serve dual purpose of being educational and – preparing you to optimize your score on Real Exams. As we’ll show momentarily – detailed explained answers plus a mini-didactic PDF is available for each question.
- Please become as familiar as you like with these Practice Exams! For example – Click on Practice Exam-1.
The picture below shows what the first 2 questions in Practice Exam-1 look like:

- Enter in your answer (True or False for Question #1).
- Click on the GRADE EXAM button after one or several questions.

You can “Grade” and “Ungrade” the Practice Exams as often as you like! The next page shows what your screen will look like after “grading” Question 1:
The picture shows your screen after grading Question 1.

- Although the text is probably too small to read – you get an idea of the detailed, explained answers provided for each question in each Practice Exam. Note link to the mini-didactic PDF on “Rate Calculation” (See next page):

Each Real Exam is identical in format to the Practice Exams – so you can truly “practice up”.

- Each test is made up of 35 questions – which should take no more than 40 minutes to complete (though of course longer when you’re taking the Practice Exams and studying the detailed explained answers).

- A “passing score” is ≥28/35 correct ( = 80% or more).
The picture below shows **detail of some features** presented in the figure on the previous page:

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**Practice Exam-1**

Question 1.

The rhythm strip shows normal sinus rhythm at a rate between 60-65/minute.

1. True
2. False

The easiest method for calculating heart rate is the "Rule-of-300". One simply divides 300 by the number of boxes in the QRS complex. The time shown for the QRS complex is 0.12 seconds. Thus, the R-R interval is 3 large boxes in duration - then the heart rate is 300/0.12 = 2500/minute. The rhythm strip shows there is a block (and normal) of conduction through the heart. The heart rate is faster than 60/minute. This means the heart is being treated for some medical condition.

**REVIEWS MATERIAL from ECG-2011-ePub (Click link to View):**
- Rate Calculation

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**Regarding the above Features:**

- Each test *(both Practice and Real Exams)* contains 35 questions. 10 questions fit per page – so 4 pages are needed to post each test. Keeping this in mind – you can easily skip to Question #11 *(will be at the top of page 2)* – or, for that matter – ahead to *any* question *(Question #32 will be the 2nd Question on page 4 ...).*
– You can “grade” or “ungrade” each Practice Exam any time you like (and as often as you may like). Simply click on the corresponding button.

• Some users prefer to “grade” after each question or two for more immediate feedback.

• Others prefer to take a Practice Exam under simulated conditions (in which case they prefer not to “grade” the exam until they have completed all 35 questions). The choice is yours …

• NOTE: There are no explained answers for Real Exams. (Providing answers would invalidate the objective assessment functionality of these Real Exams).

– After grading question(s) on the Practice Exams – you’ll receive immediate feedback as to whether your answer was correct (as well as receiving a detailed explanation of the correct answer).

• Our answer to the question on page 8 was “True”. However, the correct answer to this question is “False” (background bluish shading appears after grading – and – indicates the correct answer to each question). Thus, you immediately see after grading how you answered each question – and whether your answer was correct or not.

• Similar blue shading is used to indicate which of the 5 possible answers on multiple choice questions is correct.

• As shown on page 7 and page 8 – the detailed explained answers provided for each question on Practice Exams are also shaded in color.
Immediately on “grading” any of the Practice Exams – you’ll receive indication of how many questions you answered correctly.

- Since we immediately graded the Practice Exam on page 8 after answering only one question (which we got wrong …) – the “Total Correct” = 0.
- A 100% score (in which you answer all questions correctly) would show as “Total Correct 35.”
- As previously noted – a score of 80% is “passing” (which is obtained when ≥28/35 questions are correct).

Practice Exams serve dual purpose of being educational and preparing you to optimize your score on the Real Exams.

- This is why we provide full detailed explanation after grading each question on each Practice Exam.
- In addition to this detailed explanation – we also include a link to a 2-to-5 page minididactic PDF on the key topic(s) of each Practice Exam (You’ll see the link for ‘Review Material on page 8 and a sample pdf on page 18).
- The mini-didactic PDF files we use have been excerpted from our ECG-2011-PB book.
- ECG-2011-PB is also available as an expanded version in epub format (for nook-kindle-ibooks).
- An additional educational resource (which is free) is our ECG BLOG (http://www.ecg-interpretation.blogspot.com/). A linked contents on this site provides ready reference.

- BOTTOM LINE: We truly want ECG Competency to be an educational site – as well as providing an objective way to assess primary care skills in ECG interpretation.
1) What is unique about ECG Competency?
   - What are my credentials for developing this program?

**ANSWER:** There is *dire* need for development of a valid *primary care ECG Assessment tool*. Attempts have been made to accomplish this – but prior ECG certification exams virtually all suffer from a series of *common faults*:

- Lack of objective means to quantitate ECG interpretation ability in *standardized* fashion.
- Lack of *objective* scoring/grading criteria.
- *Limited* number of tracings in the question bank of the important ECG entities to assess for evaluation of ECG interpretation competency.
- Failure to integrate clinical *decision-making* into the specific format of each question.
- Development of the exam by experts *less familiar* with the needs and abilities of primary care clinicians practicing both in-hospital and in ambulatory care (ie, *ACC/AHA ECG certification is aimed for the practicing cardiologist*).
- Limited number of *comparable* exams available for retesting in the event the resident/clinician does not “pass” on their first attempt.
- Lack of a comprehensive accompanying *educational* program that is *dually* aimed at improving clinically relevant ECG knowledge – *as well as* serving as a *self-instructional* means for improving one’s score on retesting.

As *developer* of **ECG Competency** – I feel my credentials and insight in the area of ECG teaching and testing are truly unique (*Brief Bio on page 20*). I *am* a family physician. I have
30 years experience in maintaining an ambulatory primary care practice – attending a family medicine hospital service – interpreting in-patient and out-patient ECGs for numerous medical providers – and teaching (including testing) ECG interpretation to medical students, residents, nurses, and other paramedical professionals.

- Since retiring from my fulltime academic position and clinical practice in July, 2010 – I have strictly devoted my professional efforts toward enhancing ECG interpretation skills among non-cardiologists.
- My publication and national presentation record over the past 35 years in the areas of ECG Interpretation/Cardiac Arrhythmias/ACLS is unmatched in primary care.
- My question bank of quality ECG tracings is extensive and continually expanding.
- I have more than 2 decades of experience in objective ECG testing.

It is out of this background experience that **ECG Competency** has finally developed. Essential to this development has been **addressing** the common faults cited on the previous page.

2) **How do we suggest that ECG Competency be used?**

- **Why is a score of 28/35 (=80%) deemed “passing”?**

**ANSWER:** ECG Competency was initially designed with goal of providing an **objective means** for documenting the ECG interpretation ability of family medicine residents.

- It is the feeling of the developer that a **score** of ≥80% (≥28/35 questions correct) correlates with an appropriate level of knowledge and interpretation ability commensurate to expectations after 2-to-3 years of residency training.

**Disclaimer:** ECG Competency is not an official certifying exam. It is the opinion of the developer that a score of 80% is passing.
Suggestions: How ECG Competency might be used ...

- In **Family Medicine Residencies**: One of the **Real Exams** might initially be given to all housestaff to assess **baseline** interpretation ability. Attaining a **score** of ≥80% on a **Real Exam** **objectively documents** a level deemed appropriate by the developer.

- The **purpose** of this **baseline Real Exam score** – is to provide guidance to each resident and the program Director as to: **i)** Which residents are *already* capably performing; and **ii)** Which residents need additional study.

- The **baseline score** is **only** a **starting point**. It is anticipated that many (most) residents early in their training will not attain an ≥80% score (**That is, after all – the purpose of residency training**). **Our Goal** is to **identify** baseline ability – **document** it – **improve** on it – and then **document** improvement **until competency** is **attained**.

- Our system allows the program Director to track progress of each resident. Ample **self-instructional material** is included (**featuring comparable-format Practice Exams with detailed explained answers and accompanying minididactic pdf files on each important topic**).

- **NOTE**: Our goal is to **develop validity** of our scoring by tracking results nationally on Real Exams used by Family Medicine Residency Programs. **This will evolve with time**. In the meantime – there now **is** an **objective** scoring system.

Use of ECG Competency by Others:

- The clinical content integrated into ECG Competency covers the gamut of conditions encountered in ambulatory and in-hospital primary care. As a result – the **Practice and Real Exams** in ECG Competency should provide a valid assessment and educational tool for **others** involved with primary care (**clinicians in practice, medical students**) – **and** – **other learners/clinicians in other** primary care fields.
3) What types of Questions are used in our ECG Exams?
   • How did we decide on these Question types?

   ANSWER: The types of questions used in ECG Competency were developed by focus on the following priorities:

   • Need for choice selection rather than prose response for all answers. In no other way can scoring be standardized with capability of providing immediate feedback on completion of the test. This is why we limit question types to True-False and Multiple Choice.

   • Need for balanced assessment of each of the major content areas in ECG and Arrhythmia interpretation. This is why each question is limited to testing a specific clinical concept. In this manner – We are able to truly make each Practice and Real Exam comparable in both level of difficulty and content tested.

   • Need for clinical relevancy. Even more important than the specific ECG fact – is emphasis by each question on clinical application.

   • Need for time efficiency (Real Exams should take no more than 40-to-45 minutes to complete).

SAMPLE QUESTIONS:

On the next 2 pages – we shows Questions #4 and #5 from our DEMO Exam. In addition to the True-False question we showed earlier – this provides an idea of the 3 types of questions used:

• True-False (See page 7).

• Multiple-Choice using a 12-lead tracing (See page 15).

• Multiple-Choice using only 6 leads (See page 16). Some concepts (such as determination of axis, bundle branch block, localization of infarct) can be easily tested by only using 6 leads (increases the specificity of our questions).
Question #4 from the DEMO-Exam:

Regarding ECG criteria for RAE (right atrial enlargement) and LAE (left atrial enlargement) — Choose the BEST answer from the following:

1. ○There is possible bilateral enlargement.
2. ○There is possible RAE and probable LAE.
3. ○There is possible RAE but no LAE.
4. ○There is definite RAE and probable LAE.
5. ○There is no ECG evidence for either RAE or LAE.

**NOTE** use of a full 12-lead ECG – with focus on a specific aspect of assessing atrial enlargement by ECG criteria.

- **Careful reading** of each question is **essential** – since we specify selection of the “BEST” answer from the choices given. Although 3 of the 5 choices are true statements – only **one choice** is a “best” answer in view of the limitations of ECG criteria (especially in the clinical context of the obvious LVH and strain seen on this tracing).
Question #5 from the DEMO-Exam:

The 6 limb leads shown were obtained from an adult with new-onset chest pain. Which interpretation is most accurate?

1. Acute inferior MI (myocardial infarction).
2. Inferior ischemia.
3. Acute high lateral MI.
4. Lateral ischemia.
5. The presence of the large Q wave in lead aVL suggests that ST-T wave changes are probably old.

NOTE use of only 6 leads – with focus on lead localization to an anatomic area defined by these 6 leads.

- Careful reading of the question is again essential – since selection of the “most accurate” interpretation is specified. Although only one answer is correct in this case – asking for the “most accurate” interpretation eliminates any chance of ambiguity in this question.
4) Why are there no explained answers for the Real Tests?

**ANSWER:** As much as we want the ECG Competency web site to be educational (*with provision of immediate feedback*) – our **highest priority** is development of an objective (*and reproducible*) means for **assessing ECG competency**.

- Provision of detailed explained answers for the *Real* Exams would destroy the validity of using these tests at different sites.
- We feel optimal learning is encouraged for the *motivated* user by the detailed explained answers (*with links to mini-didactic pdf reviews*) available with each *Practice* Exam.
- Ample opportunity exists for *additional* review on-line with my **ECG Blog** ([www.ecg-interpretation.blogspot.com](http://www.ecg-interpretation.blogspot.com)) – and with the recommended *study* guide (**ECG-2011-PB**).
- Preparation for taking (*retaking*) a *Real* Exam is afforded by taking one of the Practice Exams under similar conditions.

5) Is the ECG Competency Assessment program finished?

- **IF** not – **What lies ahead for ECG Competency?**

**ANSWER:** We are far from being done with **ECG Competency**.

- We continue to work with our web site designer to expand and enhance functionality of the ECG Competency site. **Please give us your feedback!** ([info@ecgcompetency.com](mailto:info@ecgcompetency.com))
- We plan on adding more Practice and Real Exams.
- Our **ultimate goal** is **validation** of our results in both teaching and testing of **ECG competency**.

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Shown below (and on the next page) is an example of our mini-didactic PDF files (most pdfs are 1-to-5 pages long):

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Rate & Rhythm

**Assessing** the 5 Parameters

The most important clinical point (and the real KEY to rhythm interpretation) is to utilize a **Systematic Approach**. The system we favor is based on assessing for the following 5 parameters:

- **P** waves?
- **QRS** width?
- **R** egular rhythm?
- Are **P** waves **R** elated to the **QRS**?
- Heart **R** ate?

❤ Memory Aid: "Watch your **P**'s and **Q**'s — — and the 3 **R**'s".

**Heart Rate: Calculating the Rate**

The easiest way to estimate heart rate is to use the "**Rule of 300**":

The "**Rule of 300**" — Provided the rhythm is regular, heart rate can be estimated by dividing 300 by the number of large boxes in the R-R interval (Page 5).

With the ECG machine set at the standard recording speed of 25 mm/second — the time required to record each **little box** on ECG grid paper is **0.04 second**. (Vertically, each little box is 1 mm in amplitude.)
Below is the rest of our mini-didactic pdf on **Rate calculation**:

The time required to record each **large box** on ECG grid paper is **0.20 second** (because there are 5 little boxes in each large box, and 5 X 0.04 = 0.20).

It can therefore be seen that the time to record **5 large boxes** will be one **full second** (0.20 X 5 = **1.0 second**). Thus, if a QRS complex occurs each large box (as in the above Figure) — then the R-R interval will be 0.20 second, and the **rate** of the rhythm is **300 beats/min** (i.e., 5 beats occur each second X 60 seconds/minute = 300/minute).

We schematically show in the Figure above that if the R-R interval is **2** large boxes — then the rate will be 300 - 2 = **150 beats/minute**. It follows that:

- **If** the R-R is **3** boxes, the rate will be **100/min** (300 / 3)
- **If** the R-R is **4** boxes the rate is **75/min** — and so on...
KEN GRAUER, M.D.

[May, 2012]

Professor Emeritus, Community Health & Family Medicine
College of Medicine, University of Florida

ADDRESS — Ken Grauer, MD; 8932 SW 89 Lane; Gainesville, Florida 32608
PHONE — (352) 222-9951
FAX — (352) 641-6137
E-MAIL — skgpress@mac.com

- M.D. — State University of New York at Syracuse, 1975.
- Family Practice Residency, St. Margaret Memorial Hospital, Pittsburgh, Pennsylvania, 1978.
- Faculty, Department of Community Health and Family Medicine, University of Florida College of Medicine (UF COM), 1980- July, 2010 (retired on 7/1/2010).
- (Promoted to Associate Professor in 1985; to Full Professor in 1991; and Professor Emeritus in 2010).
- Superior Accomplishment Award, University of Florida — 1991.
- Florida Academy Educator of the Year — 1st Recipient of this award presented by FAFP in 1993.
- Teaching Improvement Award (College of Medicine, University of Florida) — 1994.
- AAFP Exemplary Teaching Award (for Full-Time Academic Faculty) — 1st Recipient of this award presented by the AAFP in 1997.
- Charter Member of the Society of Teaching Scholars (UF COM) — 2000.
- UF COM Distinguished Service Award (2000); COM Exemplary Teacher Award (2006-07-08-09)
- ACLS Instructor (Affiliate ACLS Faculty for Florida from 1983-1998 — and former National ACLS Affiliate Faculty) — having participated and/or directed well over 100 ACLS Provider or Instructor courses since 1978.
- OUTSIDE INTERESTS — Passion for dancing [all Ballroom/Argentine Tango] — and equal passion for foreign languages [comfortably conversant in French and Spanish — conversational in basic German].

Dr. KEN GRAUER has served on the Editorial Board for the journals Family Practice Recertification, Internal Medicine Alert, Emergency Medicine Alert, and Procedural Skills & Office Technology. He has reviewed medical books and articles for AAFP, JAABP, JFP, Family Medicine, Archives of Family Medicine, Patient Care, JAMA, and Mosby — and has served on the Primary Care Expert Panel for Medscape. His expertise as a primary care clinician and educator in the areas of ECG/Arrhythmias/ACLS is unparalleled on national scale. He is principal author of more than 10 books, as well as numerous study aids on electrocardiography and ACLS, a contributor to the 1987 American Heart Association Textbook on Advanced Cardiac Life Support, principal author of over 75 scientific articles pertaining to cardiology or ACLS topics for family physicians, is featured on more than 45 medical videos or audioscassettes produced by the AAFP or Audio-Digest, and has been principal author of several ECG of the Month series that have been published for family physicians since 1983. He is also author of AAFP Monographs, book chapters, and previous Guest Editor of several special Cardiology issues for Primary Care Clinicians. He has made well over 300 medical presentations at major conferences statewide and nationally, including numerous workshops on ECG interpretation, Holter monitoring, and exercise testing. Dr. Grauer’s publications have sold well over 500,000 copies, and have been translated into Italian, Spanish, Russian, and Japanese.