



EMORY
UNIVERSITY
SCHOOL OF
MEDICINE

Department of
Biomedical Informatics

BMI 500: <https://tinyurl.com/bmi500>

Introduction to Biomedical Informatics

1. Expectations, Ethics, HIPAA & Communication

24th Aug 2022

Gari D. Clifford, Matt Reyna

Department of Biomedical Informatics, Emory University, Atlanta, GA USA

Department of Biomedical Engineering, Georgia Institute of Technology, Atlanta, GA, USA

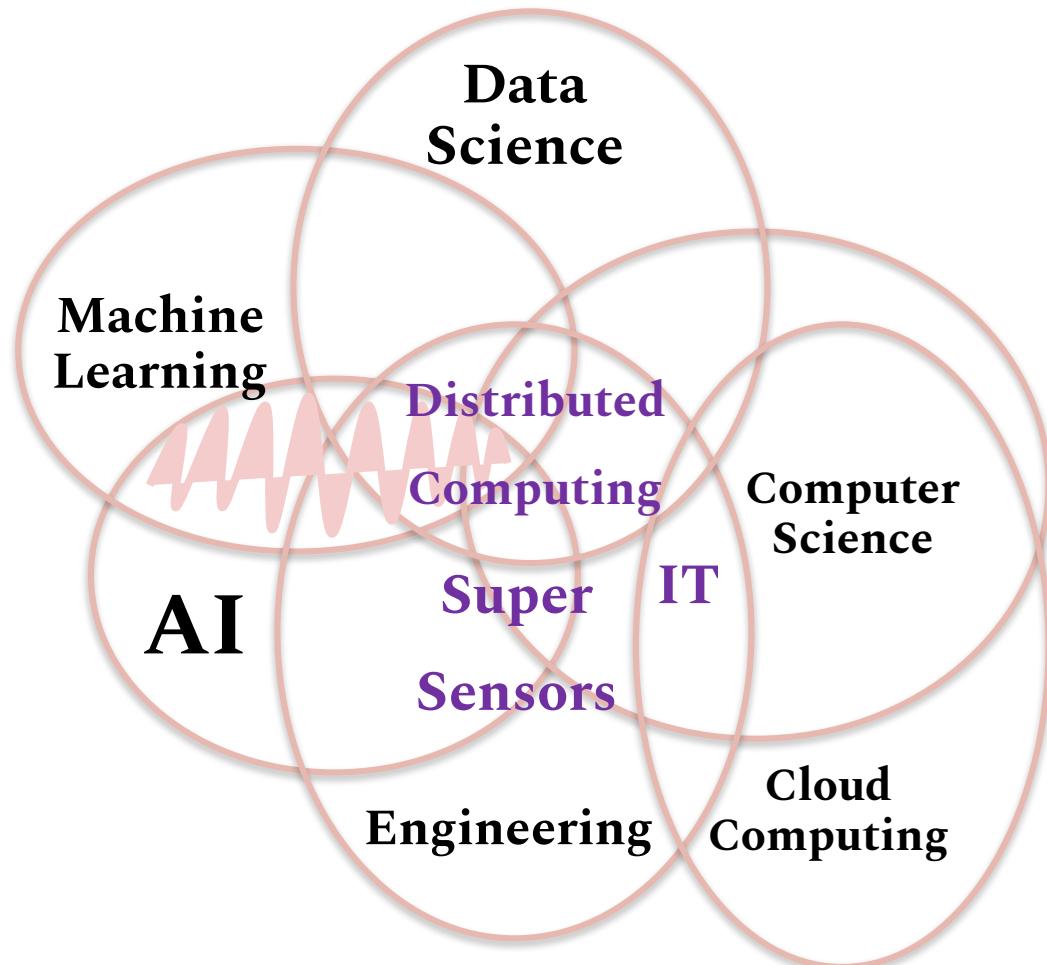
Safety First

- Emory has a **two-state operating model for COVID-19**: Instead of green, yellow, and red, Emory now has standard operations and high-response states that depend on community indicators.
- **Exposure**: Exposure risks instead of exposure = < 6 feet of an infected person for > 15 minutes over a 24 hour period: <https://www.cdc.gov/coronavirus/2019-ncov/your-health/risks-exposure.html>
- **Surges**: Emory is expecting a surge in cases in the first two weeks of the semester.
- Asymptomatic testing: Available to students, staff, and faculty, but with reduced availability: <https://www.emory.edu/forward/covid-19/testing.html>. Please take advantage of free rapid tests. you can get them at CVS!
- **Diagnostic testing**: Still available to students
- **Contact tracing**: No contact tracing teams anymore, but the university is still looking for outbreaks and has promised to contact program administrators about outbreaks in our classes. It's unclear that they will find outbreaks with less monitoring.
- **Vaccines**: Still required. Look for boosters this fall (and get your flu vaccine and (Monkey Pox vaccine) too)
- **Quarantine** (if you have a close contact): No longer required per CDC guidelines but please protect yourself and others. Please use the Zoom link if you have been sick since we last help this class. Test to return if you can. There is no penalty for being remote!
- **Isolation**: Still required for at least 5 days (7-10 is better). Do not come back if still sick. Test to return. See the "[What Do I Do If...](#)" page. No penalty for Zooming in or being too sick to be in class.
- **Masking**: Still optional but highly recommended. If I feel unsafe in a class I will cancel it. Faculty have an obligation to intervene, if we believe that someone is putting the health of the class at risk:
<https://www.emory.edu/forward/resources/policies-guidelines-protocols/index.html>

Here are the **current policies**, FAQs, and the webinar about classroom safety:

- <https://www.emory.edu/forward/>
- <https://cfde.emory.edu/news-events/news/2022/august/aug-16-fall-teaching-webinar.html>
- <https://cfde.emory.edu/news-events/news/2022/august/fall-22-teaching-faq.html>

First a few definitions ...



AI - Systems built by humans to mimic things that humans do that we ascribe to being intelligent, like conversation. See: the Turing test

Machine learning -
An algorithm, implemented on a computational device, that can iteratively learn patterns in data to classify, predict, filter, or otherwise transform data to make the input data more useful.

Clinical informatics?



Clinical Informatics is the application of informatics and information technology to deliver healthcare services.

It is also referred to as applied clinical informatics and operational informatics.

The American Medical Informatics Association (AMIA) considers informatics when used for healthcare delivery to be essentially the same regardless of the health professional group involved (whether dentist, pharmacist, physician, nurse, or other health professional).

Clinical Informatics is concerned with information use in health care by clinicians. Clinical informatics includes a wide range of topics ranging from clinical decision support to visual images (e.g. radiological, pathological, dermatological, ophthalmological, etc); from clinical documentation to provider order entry systems; and from system design to system implementation and adoption issues.

Health informatics is the modern combination of information technology, healthcare as a business, and patient experience,

Medical informatics is found at the intersection of healthcare and technology. It is where skills in both medical and computer sciences come together in an effort to improve healthcare and patient outcomes.

Syllabus: Timetable

GILMORE & PITTSBURGH RAILROAD CO., LTD.

W. N. BICHLER, President and Gen. Manager, Armstead, Mont.
F. W. SWEENEY, Comptroller, St. Paul, Minn.
P. B. LACY, Treasurer,

OFFICES Armstead, Mont.

	Motor.	Mls.	February, 1935	Mls.	Motor.	Motor.
1125 P.M.	o	lve.	Armstead ¹ ...arr.	100.3	11245 P.M.	
155 *	10.9		Grant	89.4	12 15 P.M.	
230 *	30.6		Brenner	79.7	1X 45 A.M.	
250 *	37.4		Donovan	72.0	11 25 *	
330 *	37.4		Tunnel	62.0	10 45 *	
357 *	44.7		Cruik	55.6	10 15 *	
1425 P.M.	55.0	arr.	Leadore ...lve.	45.3	19 30 A.M.	12 20 P.M.
7405 A.M.	74.5	arr.	Gilmore ...lve.	64.5		74105 A.M.
	74.5	lve.	Gilmore ...arr.	64.5	61050 A.M.	
1425 P.M.	55.0	lve.	Leadore ...arr.	45.3	19 30 A.M.	
525 *	72.7		Lemhi	27.6	8 30 *	
550 *	80.7		Tendoy	19.6	8 05 *	
620 *	92.3		Baker	9.0	7 30 *	
1650 P.M.	100.3	arr.	Salmon ...lve.	0	17 00 A.M.	

EXPLANATION OF SIGNS.

† Daily, except Sunday.

‡ Tuesday, Thursday and Saturday.

STANDARD—Mountain time.

CONNECTION.

¹ With Oregon Short Line R.R.

See link [here](#)

- Week 1, Aug 24
- Week 2, Aug 31
- Week 3, Sept 7
- Week 4, Sep 14
- Week 5, Sep 21
- Week 6, Sep 28
- Week 7, Oct 5
- Week 8, Oct 12
- Week 9, Oct 19
- Week 10, Oct 26
- Week 11, Nov 2
- Week 12, Nov 9
- Week 13, Nov 16
- Week 14, Nov 23
- Week 15, Nov 30

- Orientation - Expectations, Ethics, HIPAA & Communication
- Coding, documentation, security, data wrangling & the cluster
- Python Bootcamp
- Better Data Treatment
- Natural Language Processing
- Text Representations, Ontologies and Knowledge bases
- Bias in Informatics - It's not AI, it's us
- Ethics, De-identification & HIPAA revisited
- Clinical Informatics
- Neuroinformatics
- Model-Based Machine Learning
- Wearables in Clinical Assessment: NeuroMotion Analysis
- Edge computing and Nearables in Clinical Motion Analysis
- NO CLASS – Thanksgiving recess -- and end of lectures!**
- Final Project Review / Presentations

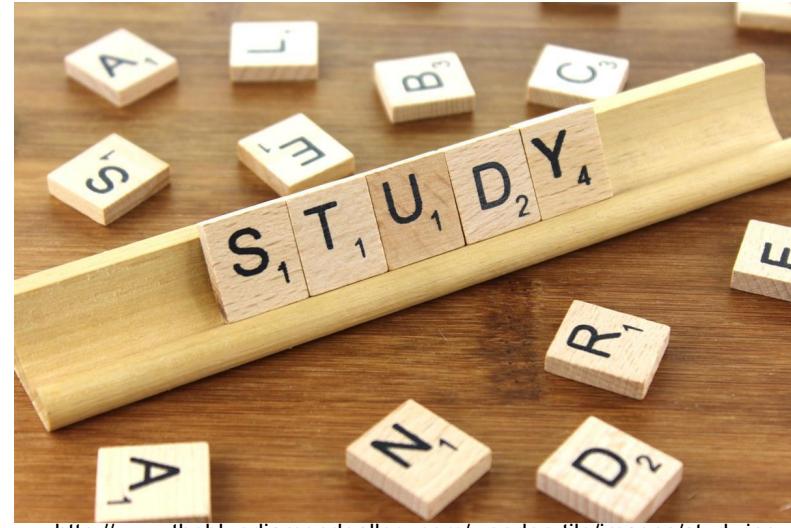
- Instructor: Clifford
- Instructor: Pan
- Instructor: Kamaleswaran
- Instructor: Reyna
- Instructor: Sarker
- Instructor: Sarker
- Instructor: Clifford
- Instructor: Clifford
- Instructor: Kamaleswaran
- Instructor: Mahmoudi
- Instructor: Sameni
- Instructor: McKay
- Instructor: McKay
- Instructor: Food!*
- Instructor: Clifford

Final Project Deadline = 2nd December at 5pm Eastern Standard Time.

Syllabus: Format

Generally:

- 50-60 minute hour lecture
 - No to food/drink/foot traffic
 - Yes to questions!
- 10 minute break
 - Feel free to leave but (stay logged on and) be back on time or you'll miss the instructions for the lab
- 80 minute lab
 - Bring a laptop
 - Come and go as you please
 - Use the 'white' boards (east and south walls only in class or Google Jamboard online)
 - No food or drink in the classroom / during class - take a break



<http://www.thebluediamondgallery.com/wooden-tile/images/study.jpg>

Video Etiquette

- Camera on at ~all times
 - I need to read your faces
 - I want to see you are paying attention
 - Treat it like a real class - because it is
 - Eat and drink off camera during breaks
 - Raise your hand (digitally) to ask a question - let's try this.
 - Use the chat function - public only, or private chat the TA. Do not private chat each other.
 - Do not bring/invite friends or colleagues - only enrolled students may attend
 - Do not screen grab or otherwise record materials and definitely do not post information from the class or share with others outside the class.
- Just like any other meeting or class, turn up 10 minutes early.
 - If you are not able to log on, email me via your phone.
 - If you do not have a functional camera please order one or contact me if that is an issue.
 - If your Internet is too slow, please call in via your cellphone.
- Prepare before you come ... it should go without saying:
 - Get dressed
 - Go to the bathroom
 - Eat and drink
 - Test your video and microphone

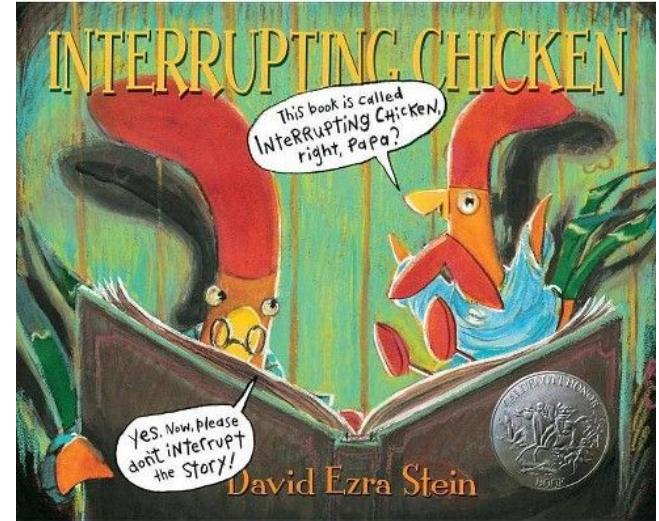


<https://techcrunch.com/2020/03/17/zoombombing/>

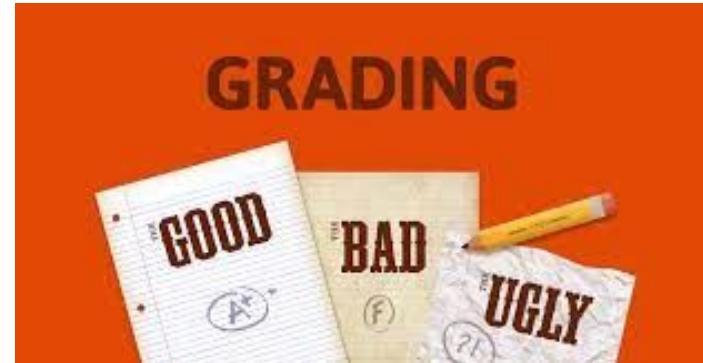
Interrupting chicken

Whether you are in person or not:

- Log on to Zoom
- Ask questions during the lecture via the chat tool
- Make sure they are directed to the TA
- TA will respond as appropriate, or assemble the questions and interrupt me when there's no clarity
- Asking questions is good => engagement and better grade!
- Don't be afraid to be wrong or show gaps in knowledge



Deliverables /



Each week (5% of mark) comprises:

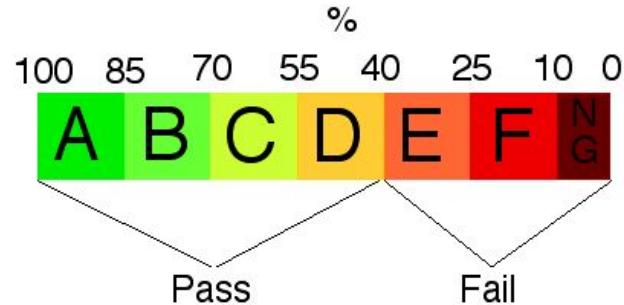
- Participation, punctuality, and preparation (e.g. doing the set readings, asking questions ...) [30%]
- Project/assignment quality (not presentation) [50%]
- Presentation and documentation (e.g. style & readability of *your* code, README, etc.) [20%]

Final project (Overleaf report) is worth 30%

Work on this every week!! You should be putting and average of 2-3 hours on this every week ... so there's no time to scramble on this in the last week.

Expectations: grading

- Filled in by the week's instructor and averaged.
- Graded on a curve



https://upload.wikimedia.org/wikipedia/commons/e/e0/Junior_certificate_grading.png



JOE SIEGEL CLARK © 2013

<http://www.phdcomics.com/comics/archive/phd012014s.gif>

BMI 500 Class Grades Fall 2018 ★

File Edit View Insert Format Data Tools Add-ons Help All changes saved in Drive

undo redo 100% \$ % .0 .00 123 Arial 10 B I S A

=(C2*0.3)+(D2*0.5)+(E2*0.2)

A	B	C	D	E	F
Student Name	Student Email	Punctuality, attendance & class participation /100 (30% of grade)	Project performance /100 (50%)	Presentation and documentation /100 (20%)	Overall Grade

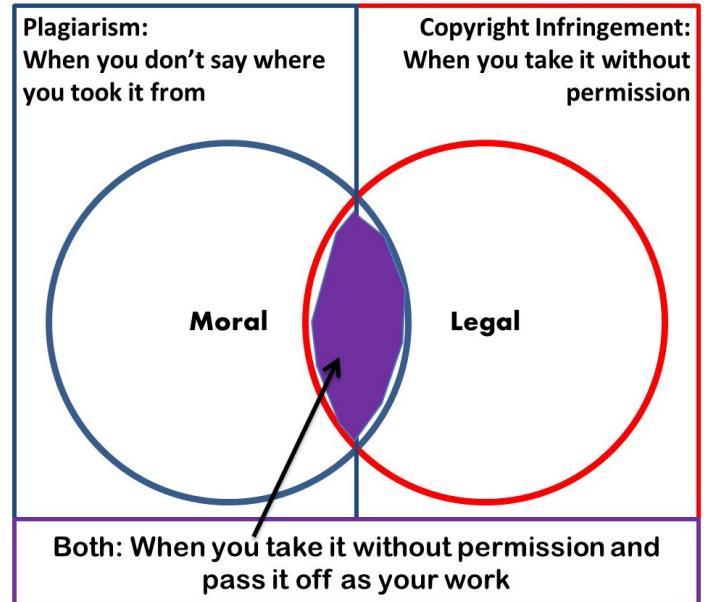
Expectations: time keeping



https://www.nps.gov/stea/learn/news/images/Santa-Awaiting-Holiday-Express-Arrival_300.JPG

- Aim to be here 10 minutes early. If you are coming in on time, you are late ... it's 9am+dT really.
- If you are going to be late or absent, email me with the reason in advance. If it's good you won't lose points.
- If you don't let me know in advance, send me an email afterwards explaining why you couldn't email before.
- Class ends at 11.45 am. You can come and go as you please between 10 am and 11.45 am but not from 9-10 am unless it's an emergency.

Expectations: collaboration & copying



- You may ask each other for help.
- If you do, note where you were helped
- Do not copy
 - You don't learn anything,
 - I don't know what you don't know,
 - Your peers will lose respect for you, and
 - You'll get found out == career impact

https://upload.wikimedia.org/wikipedia/en/e/5/Plagiarism_vs_Copyright_Infringement.png

Science relies on a community of trust. If your peers can't trust you, your research means nothing.

Expectations: Attribution

- You don't have to attribute accepted concepts (like the Fourier Transform)
- Otherwise - cite them properly - **full** citation
- General rule: If the person who published the idea is still alive, cite them (it's like copyright)
- That doesn't mean you should steal ideas from dead people - but if it's famous then you don't need to cite.
- <https://www.plagiarism.org/article/citation-styles>

How to cite

<https://www.library.ucdavis.edu/guide/citation-styles/>

Source	Example
Book	<p>Author Name. <i>Title.</i> Place of Publication: Publisher, Year.</p> <p>Macfarlane, Bruce. <i>Researching with Integrity: The Ethics of Academic Enquiry.</i> New York: Routledge, 2009.</p>
Book Chapter	<p>Author Name. “Chapter Title.” <i>Book Title.</i> Editor. Place of Publication: Publisher, Year. Chapter Page Numbers.</p> <p>Tan, Amy. “Yes and No.” <i>The Genius of Language: Fifteen Writers Reflect on Their Mother Tongues.</i> Ed. Wendy Lesser. New York: Pantheon Books, 2004. 25-34.</p>
Journal Article	<p>Author Name. “Article Title.” <i>Journal Title</i> Volume Number.Issue Number(Year): Article Page Numbers.</p> <p>Hess, Mickey. “Was Foucault A Plagiarist? Hip-Hop Sampling And Academic Citation.” <i>Computers & Composition</i> 23.3 (2006): 280-295.</p>
Website	<p>Author Name. “Title of Page/Work.” <i>Title of Website.</i> Publisher of Site. Date of Publication. Date of Access.</p> <p>Stolley, Karl, Allen Brizee and Joshua M. Paiz. “Avoiding Plagiarism.” <i>Purdue OWL.</i> Purdue University. 7 May 2012. 27 Sept. 2012.</p>

How to cite

- Websites: (Try not to ... but if you must:)

Cain, K. (2012, June 29). The Negative effects of Facebook on communication. *Social Media Today RSS*. Retrieved from <http://socialmediatoday.com> (Accessed: 2018/08/26)

- Never cite Wikipedia - cite original sources
- Acknowledging images:

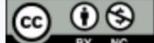
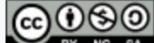
- artist
- title of work
- date of creation of work
- type of materials (optional)
- dimensions of the work (optional)
- URL
- access date



Giambattista Tiepolo, *The Banquet of Cleopatra*, 1743-44, oil on canvas, 250.3 x 357.0 cm, accessed 24 May, 2012, <http://www.ngv.vic.gov.au/col/work/4409>.

How to cite - check the license

Do you have the right to use the image?

Icon	Description	Acronym	Allows Remix culture	Allows commercial use	Allows Free Cultural Works	Meets 'Open Definition'
	Freeing content globally without restrictions	CC0	Yes	Yes	Yes	Yes
	Attribution alone	BY	Yes	Yes	Yes	Yes
	Attribution + ShareAlike	BY-SA	Yes	Yes	Yes	Yes
	Attribution + Noncommercial	BY-NC	Yes	No	No	No
	Attribution + Noncommercial + ShareAlike	BY-NC-SA	Yes	No	No	No
	Attribution + NoDerivatives	BY-ND	No	Yes	No	No
	Attribution + Noncommercial + NoDerivatives	BY-NC-ND	No	No	No	No

https://en.wikipedia.org/wiki/Creative Commons_license#Zero / public_domain

https://en.wikipedia.org/wiki/Software_license

Finding unrestricted images

The screenshot shows the Google Advanced Image Search interface. At the top, there are search boxes for finding images based on words or phrases. Below that, a section titled "Then narrow your results by..." contains various filters like image size, aspect ratio, colors, type, region, site, SafeSearch, file type, and usage rights. A large blue arrow points downwards from the top of the page towards the "usage rights" dropdown menu. This menu is currently open, showing options: "not filtered by license", "free to use or share", "free to use or share, even commercially", "free to use share or modify", and "free to use, share or modify, even commercially". At the bottom left, there are links for similar pages and visited pages.

Find images with...

To do this in the search box

all these words: Type the important words: winter hoarfrost

this exact word or phrase: Put exact words in quotes: "frost flower"

any of these words: Type OR between all the words you want: trees OR weeds OR grasses

none of these words: Put a minus sign just before words you don't want: -windows

Then narrow your results by...

image size: any size Find images in any size you need.

aspect ratio: any aspect ratio Specify the shape of images.

colors in image: any color full color black & white transparent this color: █ Find images in your preferred colors.

type of image: any type Limit the kind of images you find.

region: any region Find images published in a particular region.

site or domain: Search one site (like sfmoma.org) or limit your results to a domain like .edu, .org or .gov

SafeSearch: Show most relevant results Tell SafeSearch whether to filter sexually explicit content.

file type: any format Find images in the format you prefer.

usage rights: not filtered by license Find images you are free to use yourself.

not filtered by license

free to use or share

free to use or share, even commercially

free to use share or modify

free to use, share or modify, even commercially

You can also...

Find pages that are similar to, or link to, a URL
Search pages you've visited

Things you should never put in articles, presentations etc

- Information you might want to patent
(that's why you check with all the other contributors first before submitting sending outside your research group)
- Images or personal information of people, even colleagues, who haven't provided written permission.
- Any identifiable information from a study subject that is not already in the public domain.



<https://www.theverge.com/2020/6/4/21280112/signal-face-blurring-tool-ios-android-update>



<https://www.theverge.com/2020/6/4/21280112/signal-face-blurring-tool-ios-android-update>

Protected Health Information

1. What is HIPAA?
2. Why is HIPAA Important?
3. HIPAA Definitions
4. HIPAA Enforcement
5. Patient Rights
6. HIPAA Privacy Requirements
7. The Breach Notification Rule
8. Release of Information (ROI)
9. HIPAA Security Rule
10. PHI Safeguarding Tips
11. Business Associate Agreements
12. HIPAA Violations and Complaints
13. Discussion Slides

What is HIPAA?

- Acronym for Health Insurance Portability & Accountability Act of 1996 (45 C.F.R. parts 160 & 164)
- Provides a framework for establishment of nationwide protection of patient confidentiality, security of electronic systems, and standards and requirements for electronic transmission of health information.

What is HIPAA?

- 
- Privacy Rule
 - Security Rule
 - Electronic Data Exchange

Legal Foundation: Privacy Rule & Security Rule

- ▶ Privacy Rule went into effect **April 14, 2003.**
 - ▶ Privacy refers to protection of an individual's health care data.
 - ▶ Defines how patient information used and disclosed.
 - ▶ Gives patients privacy rights and more control over their own health information.
 - ▶ Outlines ways to safeguard Protected Health Information (PHI).
-
- ▶ Security (IT) regulations went into effect **April 21, 2005.**
 - ▶ Security means controlling:
 - **Confidentiality** of electronic protected health information (ePHI).
 - **Storage** of electronic protected health information (ePHI)
 - **Access** into electronic information

HIPAA Scope

HIPAA Regulations require we protect our subjects' PHI on all media including, but not limited to, PHI created, stored, or transmitted in/on the following media:

- **Verbal Discussions** (i.e. in person or on the phone)
- **Written** on paper (i.e. chart, progress notes, encounter forms, prescriptions, x-ray orders, referral forms and explanation of benefit (EOBs) forms
- **Computer Applications and Systems** (i.e. electronic health record (EHR), Practice Management, Lab and X-Ray
- **Computer Hardware/Equipment** (i.e. PCs, laptops, PDAs, pagers, fax machines, servers and cell phones, ...)

HIPAA Scope

- ▶ Protected Health Information (PHI) is individually identifiable health information that is:
 - Created or received by a health care provider, health plan, employer, or health care clearinghouse and that
 - Relates to the past, present, or future physical or mental health or condition of an individual;
 - Relates to the provision of health care to an individual
 - The past, present or future payment for the provision of health care to an individual.

What is PHI?

PHI includes information by which the identity of a patient can be determined with reasonable accuracy and speed either directly or by reference to other publicly available information

Even if you encrypt the data, someone may (will) crack it.

15И'7 17 4M4Z1NG 7H47
YOU C4И R34D 7H15 3V3И
7H0UGH 0NLY 4
M1N0R17Y OF 7H3
"L3773R5" 4R3 C0RR3C7?
7H3 И30C0R73X 15
4M4Z1NG! 4ND D0 YOU
И071C3 7H47 R34D1NG
7H15 B3C0M35 M0R3
4UT0M4T1C 45 YOU G0
4LONG? 7H15 15 7RU3
3V3И 7H0UGH R1GH7 И0W
YOU 4R3 UNL1K3LY 70 B3
C0И5C10U5 OF WH1CH
5YMB0L5 4R3 R3PL4C1NG
WH1CH L3773R5.



In this tutorial we will show you how to create a list of MD5 password hashes and crack them using [hashcat](#).

We will perform a dictionary attack using the `rockyou` wordlist on a Kali Linux box.

CREATING A LIST OF MD5 HASHES TO CRACK

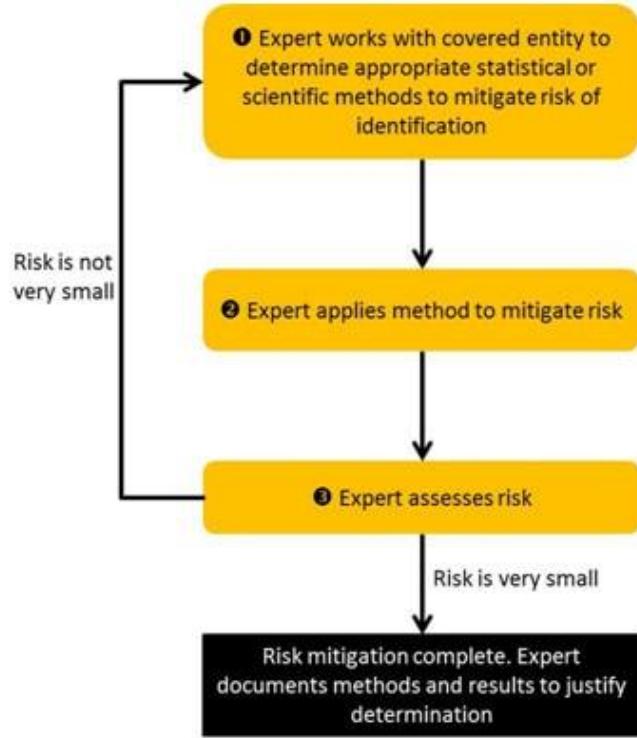
To create a list of MD5 hashes, we can use of `md5sum` command.

The full command we want to use is:

```
echo -n "Password1" | md5sum | tr -d " -" >> hashes
```

So Scrub your PHI!

Principles used by experts in the determination of the identifiability of health information:



Covered entities are defined in the HIPAA rules as (1) health plans, (2) health care clearinghouses, and (3) health care providers who electronically transmit any health information in connection with transactions for which HHS has adopted standards.

Principle	Description	Examples
Replicability	Prioritize health information features into levels of risk according to the chance it will consistently occur in relation to the individual.	<i>Low:</i> Results of a patient's blood glucose level test will vary <i>High:</i> Demographics of a patient (e.g., birth date) are relatively stable
	Determine which external data sources contain the patients' identifiers and the replicable features in the health information, as well as who is permitted access to the data source.	<i>Low:</i> The results of laboratory reports are not often disclosed with identity beyond healthcare environments. <i>High:</i> Patient name and demographics are often in public data sources, such as vital records -- birth, death, and marriage registries.
Distinguishability	Determine the extent to which the subject's data can be distinguished in the health information.	<i>Low:</i> It has been estimated that the combination of <i>Year of Birth, Gender, and 3-Digit ZIP Code</i> is unique for approximately 0.04% of residents in the United States ⁹ . This means that very few residents could be identified through this combination of data alone. <i>High:</i> It has been estimated that the combination of a patient's <i>Date of Birth, Gender, and 5-Digit ZIP Code</i> is unique for over 50% of residents in the United States ^{10,11} . This means that over half of U.S. residents could be uniquely described just with these three data elements.
Assess Risk	The greater the replicability, availability, and distinguishability of the health information, the greater the risk for identification.	<i>Low:</i> Laboratory values may be very distinguishing, but they are rarely independently replicable and are rarely disclosed in multiple data sources to which many people have access. <i>High:</i> Demographics are highly distinguishing, highly replicable, and are available in public data sources.

PHI Categories

PHI Type	Notes
Names	Both full and partial, but not initials
Locations	All geographic subdivisions smaller than a state, including street address, city, county, precinct, zip code, and their equivalent geocodes
Dates	All elements of dates (except years) for dates directly related to an individual, including birth date, admission date, discharge date, date of death
Ages > 89 years	All elements of dates (including year) indicative of an age over 89 years. Such ages and elements may be aggregated into a single category of age 90 or older
Telephone numbers	
Fax numbers	
Electronic mail addresses	
Social security numbers	
Medical record numbers	
Health plan beneficiary numbers	
Account numbers	
Certificate/license numbers	
Vehicle identifiers	Includes vehicle serial numbers and license plate numbers
Device identifiers and serial numbers	Not restricted to medical devices
Web Universal Resource Locators (URLs)	
Internet Protocol (IP) address numbers	
Biometric identifiers	Includes finger and voice prints
Any other unique identifying number, code, or characteristic	E.g., full face photographic images of full faces, scars or tattoos (and any comparable images).

Secure HIPAA-compliant data backups

Three or four places you can place PHI:

- BMI Servers
- OneDrive
- AWS (aws.emory.edu not aws.com - but check which services Emory approves)
- Not on your laptop or desktop (but encrypt it anyway just in case someone emails you PHI)
- Not your phone or tablet
- Never email PHI - someone will forward it or you will copy the wrong person

The origin of the IRB



Modern concern regarding the ethics of research involving human subjects developed as the result of the Nazi regime's atrocities during World War II.

WANTED

Dr. Mengele is known 40%
An artist's conception of what Mengele would look like today at age 74.

Dr. Josef Mengele
For his crimes against humanity

Josef Mengele was responsible for the death of 400,000 persons at Auschwitz Concentration Camp. He tortured children and made their parents suffer. He brutalized people with horrible medical experiments.

Mengele is 74. Height 1.7 m (5'7"). Eyes, greenish brown. He became a citizen of Argentina in 1964, a citizen of Paraguay in 1969.

Rewards worldwide total more than U.S. \$43,370 million for information leading to the arrest and extradition of Dr. Josef Mengele.

Contact: Martin Mendelsohn, P.O. Box 33126, Washington, D.C. 20033, or call Simon Wiesenthal Center, (213) 853-9036. All information will be held confidential.

Human Subject Research and the Collaborative Institutional Training Initiative (CITI)



The following ten points constitute the Nuremberg Code (1953 Trials of War Criminals, 2):

1. The voluntary consent of the human subject is absolutely essential. The subject should have legal capacity to give consent / able to exercise free power of choice, without the intervention of any element of force, fraud, deceit, duress, over-reaching, or other ulterior form of constraint or coercion; and should have sufficient knowledge and comprehension of the elements of the subject matter involved, as to enable him to make an understanding and enlightened decision. This latter element requires that, before the acceptance of an affirmative decision by the experimental subject, there should be made known to him the nature, duration, and purpose of the experiment; the method and means by which it is to be conducted; all inconveniences and hazards reasonably to be expected; and the effects upon his health or person, which may possibly come from his participation in the experiment. The duty and responsibility for ascertaining the quality of the consent rests upon each individual who initiates, directs or engages in the experiment. It may not be delegated to another with impunity.
2. The experiment should be such as to yield fruitful results for the good of society, unprocurable by other methods or means of study, and not random and unnecessary in nature.
3. The experimental design should be based on the results of animal experimentation and a knowledge of the natural history of the disease or other problem under study.

Human Subject Research and the Collaborative Institutional Training Initiative (CITI)



4. The experiment should be so conducted as to avoid all unnecessary physical and mental suffering and injury.
5. No experiment should be conducted, where there is an *apriori* reason to believe that death or disabling injury will occur; except, perhaps, in those experiments where the experimental physicians also serve as subjects.
6. The degree of risk to be taken should never exceed that determined by the humanitarian importance of the problem to be solved by the experiment.
7. Proper preparations should be made and adequate facilities provided to protect the experimental subject against even remote possibilities of injury, disability, or death.
8. The experiment should be conducted only by scientifically qualified persons. The highest degree of skill and care should be required through all stages of the experiment of those who conduct or engage in the experiment.
9. During the course of the experiment, the human subject should be at liberty to bring the experiment to an end, if he has reached the physical or mental state, where continuation of the experiment seemed to him to be impossible.
10. During the course of the experiment, the scientist in charge must be prepared to terminate the experiment at any stage, if he has probable cause to believe, in the exercise of the good faith, superior skill and careful judgement (sic) required of him, that a continuation of the experiment is likely to result in injury, disability, or death to the experimental subject.

An example closer to home ...

Tuskegee syphilis experiment

The Tuskegee syphilis experiment was an infamous clinical study conducted between 1932 and 1972 by the U.S. Public Health Service to study the natural progression of untreated syphilis in rural African-American men in Alabama. Wikipedia



The New York Times

Syphilis Victims in U.S. Study Went Untreated for 40 Years

By JEAN HELLER
The Associated Press

WASHINGTON, July 25—For 40 years the United States Public Health Service has conducted a study in which human beings with syphilis, who were induced to serve as guinea pigs, have gone without medical treatment for the disease and a few have died of its late effects, even though an effective therapy was eventually discovered.

The study was conducted to determine from autopsies what the disease does to the human body.

Officials of the health service who initiated the experiment have long since retired. Current officials, who say they

have serious doubts about the morality of the study, also say that it is too late to treat the syphilis in any surviving participants.

Doctors in the service say they are now rendering whatever other medical services they can give to the survivors while the study of the disease's effects continues.

Dr. Merlin K. DuVal, Assistant Secretary of Health, Education and Welfare for Health and Scientific Affairs, expressed shock on learning of the study. He said that he was making an immediate investigation.

The experiment, called the Tuskegee Study, began in 1932 with about 600 black men,

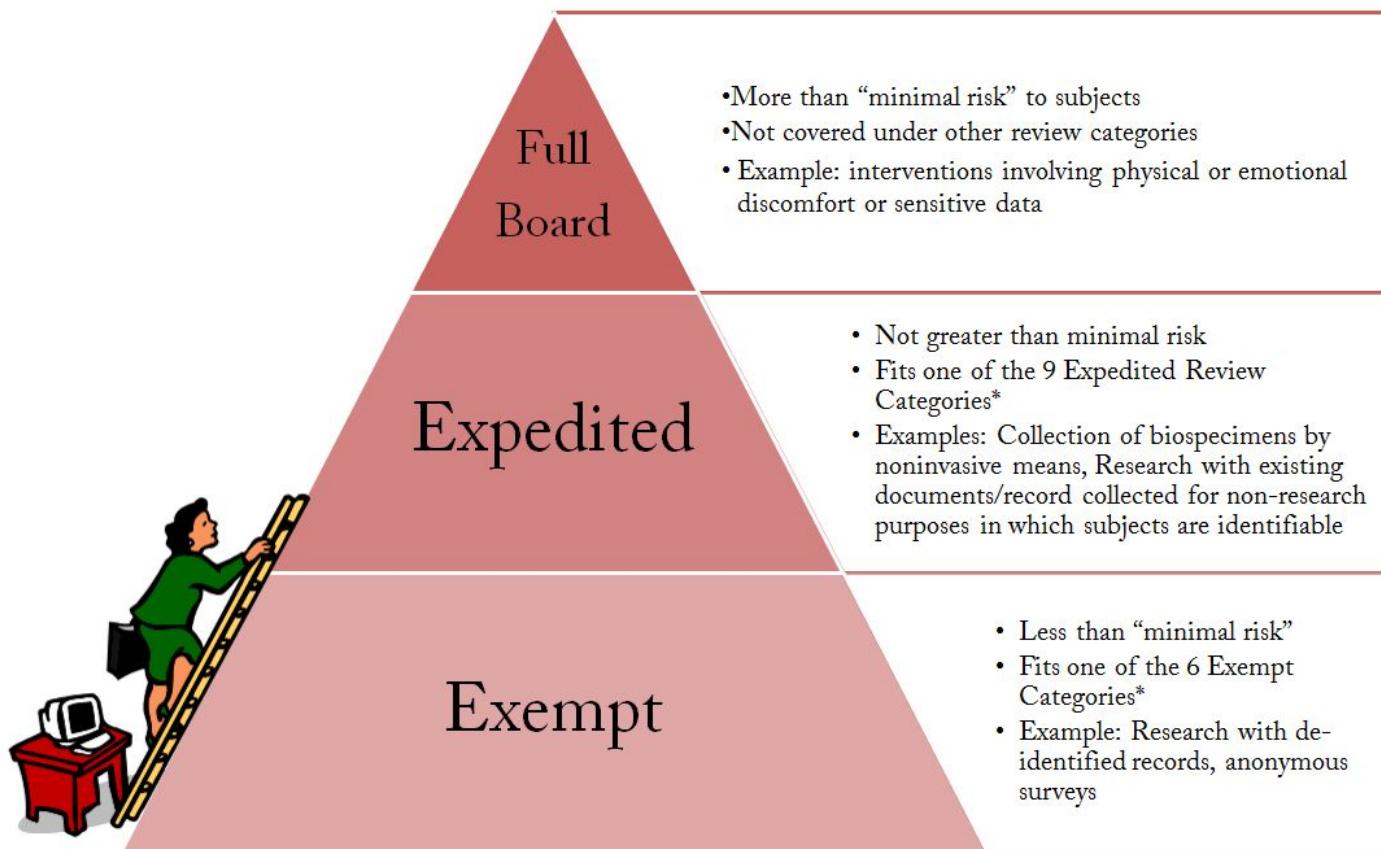


The Institutional Review Board (IRB)

- An IRB, also known as an independent ethics committee (IEC), ethical review board (ERB), or research ethics board (REB), is a type of committee that applies research ethics by reviewing the methods proposed for research to ensure that they are ethical.
- Such boards are formally designated to approve (or reject), monitor, and review biomedical and behavioral research involving humans.
- They often conduct some form of risk-benefit analysis in an attempt to determine whether or not research should be conducted

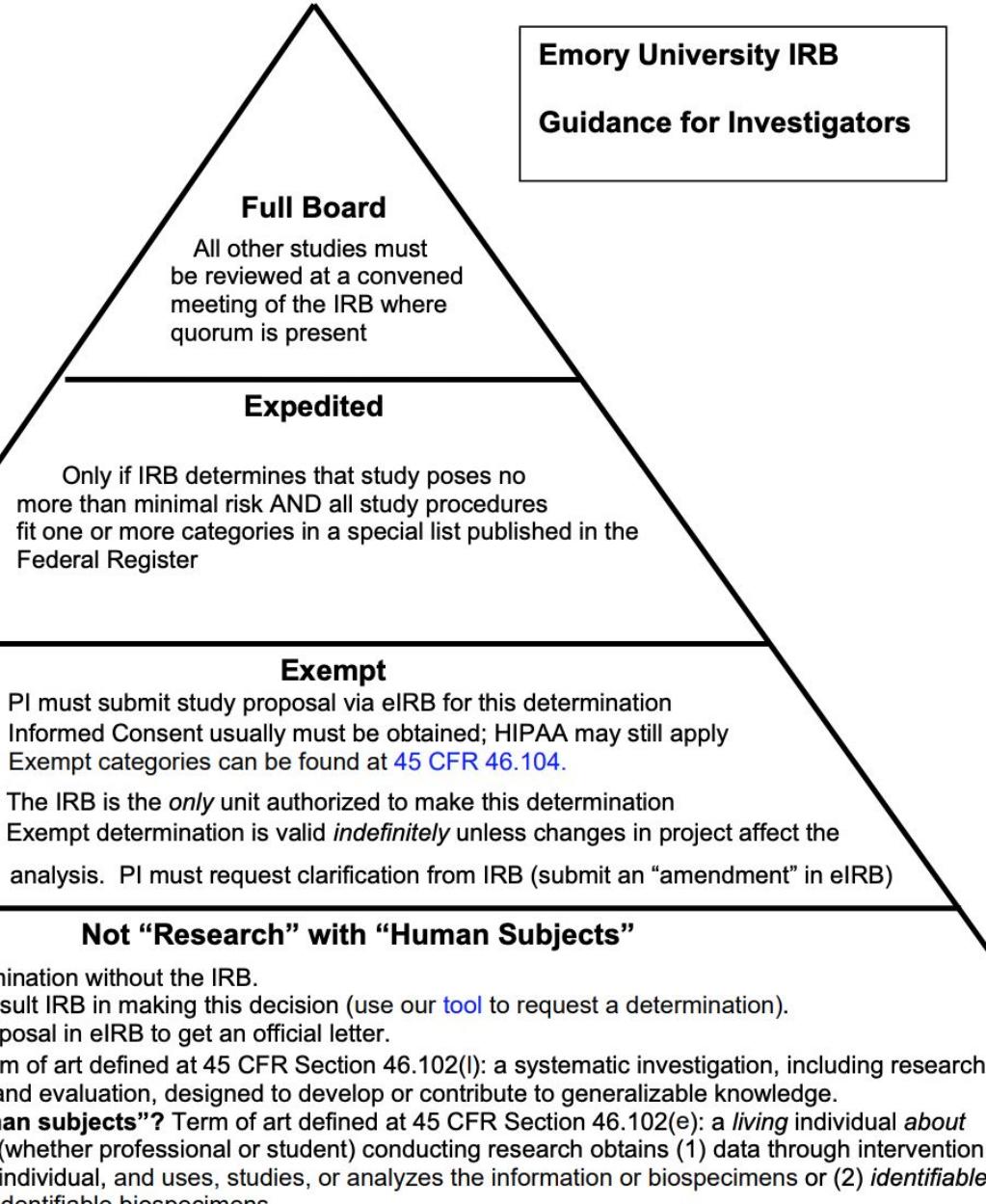
The Institutional Review Board (IRB)

Levels of IRB Review



*Defined by federal regulation (45 CFR 46)

Questions? Contact the
IRB staff at (404) 712-0720
or irb@emory.edu



General examples: case studies (descriptive without drawing generalizing conclusions); public domain literature review; local-only QI project

The (revised) common rule (from Jan 2019)

<https://www.hhs.gov/ohrp/regulations-and-policy/regulations/finalized-revisions-common-rule/index.html>

New Exempt Categories

The Common Rule defines three levels of review for human subjects research: **exempt, expedited, and full (committee)**. The new Common Rule broadens the types of research that may be determined to be exempt from IRB review. E.g., benign behavioral interventions conducted with adults may be determined to be exempt as well as de-identified retrospective data. The collection of identifiable, sensitive information from adults may only require a limited IRB review to determine that appropriate privacy and confidentiality protections are in place. In all cases Researchers must submit to the IRB program for a determination that activities are exempt from IRB review.

Continuing Review Changes

Some minimal risk studies will no longer be required to renew their IRB approval on an annual basis (continuing review).

Consent Form Changes

Consent forms will need to include a brief summary that explains the research to potential participants in an easy-to-understand and clear manner. **It is now mandated that consent forms be concise while also giving the full context of a study, including its risks and benefits, so potential participants have all the information they need to make an informed decision.** Consent forms will also need to include information regarding the potential for future use of de-identified data and biospecimens.

In addition, there is a new requirement that cooperative research studies involving more than one institution to use a single IRB for review. The implementation date for this requirement is January 19, 2020.

Now for your HIPAA & CITI certification!

HIPAA:

1. Install the Adobe Flash plugin for your system if you don't already have it.
<https://get.adobe.com/flashplayer/>
2. Log into ELMS at <https://elmpd9.emory.edu/>
3. Search for and **complete** each of the following classes:
 - HIPAA@Emory (formerly HIPAA in a Hurry) - 210001
 - HIPAA and Research (Research) - 210002
 - HIPAA Security (Security) - 210003(search by the six-digit code)

CITI:

1. Navigate to <http://www.citiprogram.org/>
2. Click "Log In", then click "Log In Through My Institution" and select Emory University
3. Select "Emory University Courses"
4. Select "Add a course" and then click on "Continue to question 1" at the bottom of the page
5. We are interested in the **Health Privacy & Information Security** material at the end of the list
6. At the bottom of the page select **Health Privacy & Information Security** again
7. Select **Health Privacy & Information Security** once again to start the course

Now for your HIPAA & CITI certification!

COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)

COMPLETION REPORT - PART 1 OF 2
COURSEWORK REQUIREMENTS*

* NOTE: Scores on this Requirements Report reflect quiz completions at the time all requirements for the course were met. See list below for details. See separate Transcript Report for more recent quiz scores, including those on optional (supplemental) course elements.

- Name: Gari Clifford (ID: 2810124)
- Institution Affiliation: Emory University (ID: 317)
- Institution Email: gari.clifford@emory.edu
- Institution Unit: Bioinformatics
- Phone: 1 404-712-0163

- Curriculum Group: Basic/Refresher Course Human Subjects Protection
- Course Learner Group: Group 1. Biomedical Focus
- Stage: Stage 3 - Refresher Course
- Description: This course is suitable for investigators and staff conducting BIOMEDICAL RESEARCH with human subjects. The IRB can assist you in determining whether these additional modules are necessary.

- Record ID: 35075077
- Completion Date: 21-Apr-2020
- Expiration Date: 21-Apr-2023
- Minimum Passing: 80
- Reported Score*: 96

REQUIRED AND ELECTIVE MODULES ONLY

	DATE COMPLETED	SCORE
Emory Institutional & Regulatory Updates (ID: 17251)	20-Apr-2020	5/5 (100%)
Audit Findings in Clinical Trials (ID: 17252)	20-Apr-2020	5/5 (100%)
Principles to Use in Resolving Ethical Issues in Research (ID: 17253)	20-Apr-2020	No Quiz
Biomed Refresher 2 - History and Ethical Principles (ID: 511)	20-Apr-2020	3/3 (100%)
Biomed Refresher 2 - Regulations and Process (ID: 512)	20-Apr-2020	2/2 (100%)
Biomed Refresher 2 - Informed Consent (ID: 514)	20-Apr-2020	3/3 (100%)
Biomed Refresher 2 - SBR Methodologies in Biomedical Research (ID: 515)	20-Apr-2020	4/4 (100%)
Biomed Refresher 2 - Records-Based Research (ID: 516)	20-Apr-2020	3/3 (100%)
Biomed Refresher 2 - Genetics Research (ID: 518)	21-Apr-2020	2/2 (100%)
Biomed Refresher 2 - Populations in Research Requiring Additional Considerations and/or Protections (ID: 519)	21-Apr-2020	1/1 (100%)
Biomed Refresher 2 - Research Involving Prisoners (ID: 520)	21-Apr-2020	2/2 (100%)
Biomed Refresher 2 - Research Involving Children (ID: 521)	21-Apr-2020	3/3 (100%)
Biomed Refresher 2 - Research Involving Pregnant Women, Fetus, and Neonates (ID: 522)	21-Apr-2020	2/2 (100%)
Biomed Refresher 2 - FDA-Regulated Research (ID: 524)	21-Apr-2020	3/3 (100%)
Biomed Refresher 2 - HIPAA and Human Subjects Research (ID: 526)	21-Apr-2020	5/5 (100%)
Biomed Refresher 2 - Conflicts of Interest in Research Involving Human Subjects (ID: 17545)	21-Apr-2020	3/5 (60%)

For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid Independent Learner.

Verify at www.citiprogram.org/verify/?k8eea9299-3283-4a68-b6b2-1763cf9f1882d-35075077

Collaborative Institutional Training Initiative (CITI Program)
Email: support@citiprogram.org
Phone: 888-529-5929
Web: <https://www.citiprogram.org>



Completion Date 21-Apr-2020
Expiration Date 21-Apr-2023
Record ID 35075077

This is to certify that:

Gari Clifford

Has completed the following CITI Program course:

Basic/Refresher Course Human Subjects Protection (Curriculum Group)
Group 1. Biomedical Focus (Course Learner Group)
3 - Refresher Course (Stage)

Not valid for renewal of certification through CME. Do not use for TransCelerate mutual recognition (see Completion Report).

Under requirements set by:

Emory University



Verify at www.citiprogram.org/verify/?wca4532a4-6633-4976-8c02-2a36a4e1fa21-35075077

**Homework for next week (remember deadline is 5pm Atlanta local time Monday following class) - Upload BOTH HIPAA and CITI certificates here:
https://drive.google.com/drive/u/0/folders/1NITJAFEpk6TguRuvPFI-eDCBUZf_qpFq**
Naming convention: SURNAME_name_of_certificate.pdf

Take a break ... (for 10 minutes)



<https://dariusforoux.com/break/>

Science communication: just as important as science

OCTOBER 5, 2018 BY THE SPACED-OUT SCIENTIST



If you don't communicate the science, you may as well never have done it.

Documentation = communication

Lab Diary:

- Google Docs
- Jupyter?
- Collab?

Articles for publication:

- Overleaf.com
- Google Docs with reference manager plugin (paperpile)
- Avoid Word if you can - it crashes all the time, online collaboration doesn't work well & version incompatibility issues exist with endnote and word itself

Thesis:

- Latex - locally (with github) or better still **Overleaf.com**
- Thesis Guide: <https://www.overleaf.com/read/vdtvfvkbxdn>

The screenshot shows the Overleaf web interface. At the top, there are tabs for 'PROJECT', 'HISTORY & REVISIONS', 'SHARE', 'PDF', 'JOURNALS & SERVICES', and buttons for 'Preview', 'Manual', and 'Auto'. The left sidebar lists files: 'files', 'DUSvalves.png', 'HeartECG.jpg', 'Review.tex', 'STFT.jpg', 'a.eps', 'b.eps', 'c.eps', 'cardiacvalves.jpg', 'changelog.txt', 'd.eps', 'heart.jpg', 'heartDoppler.png', 'iopams.sty', 'iopart.cls', and 'iopart10.clo'. The main area displays the LaTeX code for 'Review.tex':

```
\documentclass[12pt]{iopart}
\usepackage{longtable}
\usepackage{amssymb}
\newcommand{\vguide}{\it Preparing
graphics for IOP journals}
%Uncomment next line if AMS fonts
%required
\usepackage{iopams}
\usepackage{natbib}

% this is to disable \equation
%definition by iop and leave it to
%asmathet
\expandafter\let\csname
equation*\endcsname\relax
\expandafter\let\csname
endequation*\endcsname\relax
\usepackage{amsmath}
\usepackage{graphics}
\usepackage{graphicx}
\usepackage{caption}
\usepackage{color}
\usepackage{multirow}
\usepackage{soul}
```

To the right, a preview window shows a journal article titled 'Cardiotocography and Beyond: A Review of One-Dimensional Doppler Ultrasound Application in Fetal Monitoring' by Faezeh Marzbanrad¹, Lisa Stroux², Gari D. Clifford^{3,4}. The abstract discusses the use of 1D-DUS for fetal monitoring, mentioning challenges like noise, transient signals, and non-stationary nature of the signals.

Our most important communication medium:Research Articles, Thesis, etc. ...

Editorial: How to write a decent scientific article or thesis

Gari D Clifford^{1,2}and Bob B Smoot³

¹ Department of Biomedical Informatics, Emory University,
Atlanta, GA USA

² Department of Biomedical Engineering, Georgia Institute of
Technology, Atlanta, GA, USA

³ Institute for Medical Engineering & Science, Massachusetts
Institute of Technology, USA

E-mail: gari@gatech.edu

Abstract.

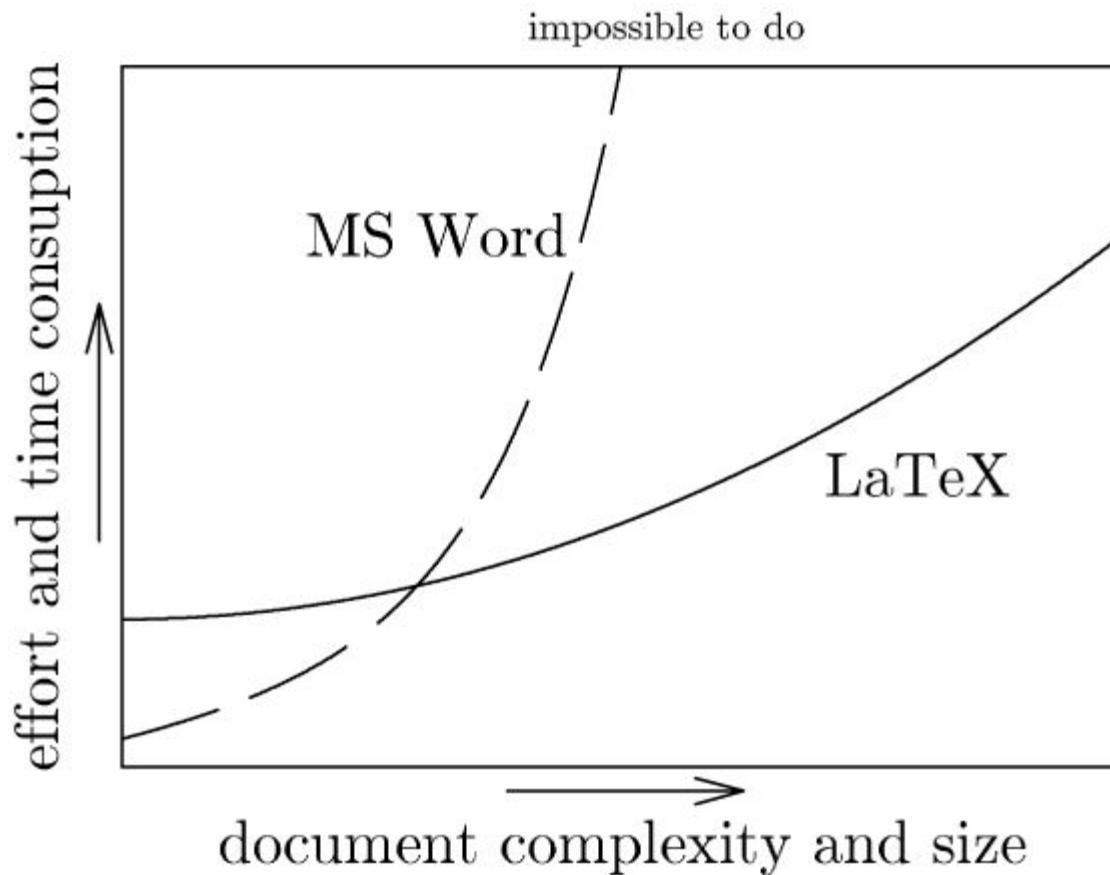
This article is designed to serve as a guide to writing a coherent and acceptable scientific document, particularly for scientific journals or a research thesis. (The LATEXsource for this editorial can be found here: <https://www.overleaf.com/read/vdtvfvkbbxdn>.) The rationale for doing this is that it seems that graduate students are no longer taught these skills, and I grew tired of saying the same things over and over. As an editor I have seen a rise in lower quality publications, and as a supervisor, I've seen a drop in quality of weekly reports.

Although I take all the blame for the mistakes in here, I have borrowed liberally from other authors and although I've attempted to credit them where I remembered, I have surely forgotten to in parts, since the information contained in this article has accumulated in my brain over multiple decades. If you think I've forgotten to cite you, let me know and I'll try to find the time to correct any errors or omissions.

This article is structured such at the information for each section appears in the section to which it refers. Therefore, the rest of this abstract details how to write an abstract, and as such is much longer than any abstract should be.

In fact, the abstract should be just a couple of paragraphs to set the scene and provide the motivation (including the clinical rationale if appropriate), then describe your key contributions to scientific knowledge and key results.

Why Latex?



Homework for the semester ...

Editorial: How to write a decent scientific article or thesis

Gari D Clifford^{1,2}and Bob B Smoot³

¹ Department of Biomedical Informatics, Emory University,
Atlanta, GA USA

² Department of Biomedical Engineering, Georgia Institute of
Technology, Atlanta, GA, USA

³ Institute for Medical Engineering & Science, Massachusetts
Institute of Technology, USA

E-mail: gari@gatech.edu

Abstract.

This article is designed to serve as a guide to writing a coherent and acceptable scientific document, particularly for scientific journals or a research thesis. (The L^AT_EXsource for this editorial can be found here: <https://www.overleaf.com/read/vdtvfvkbbxdn>.) The rationale for doing this is that it seems that graduate students are no longer taught these skills, and I grew tired of saying the same things over and over. As an editor I have seen a rise in lower quality publications, and as a supervisor, I've seen a drop in quality of weekly reports.

Although I take all the blame for the mistakes in here, I have borrowed liberally from other authors and although I've attempted to credit them where I remembered, I have surely forgotten to in parts, since the information contained in this article has accumulated in my brain over multiple decades. If you think I've forgotten to cite you, let me know and I'll try to find the time to correct any errors or omissions.

This article is structured such at the information for each section appears in the section to which it refers. Therefore, the rest of this abstract details how to write an abstract, and as such is much longer than any abstract should be.

In fact, the abstract should be just a couple of paragraphs to set the scene and provide the motivation (including the clinical rationale if appropriate), then describe your key contributions to scientific knowledge and key results.

Homework for the semester ...

- Copy the overleaf template: <https://www.overleaf.com/read/vdtvfvkbbxdn>
- Make a copy of the article and remove the contents (no logon necessary). Make sure the project is publicly readable.
- Rename it [SURNAME] BMI 500 Fall 2021 - Final Course Assignment", where [SURNAME] = your surname.
- Write a 4-8 page review on a research topic of your choice in this overleaf template, following the formatting instructions and tips on how to make a high quality article.
 - Please include at least one table and one figure.
 - The topic is unimportant, but must be somewhat related to the course.
 - It does not have to be a comprehensive review
 - Your grade will depend on your ability to follow formatting requirements, rather than how comprehensive you survey the field.
 - Pay attention to captions, images, spelling, bibliography, etc.
- Send URL of the project to your friendly TA and gari [at] dbmi.emory.edu with the subject header “[SURNAME] BMI 500 Fall 2021 - Final Course Assignment” where [SURNAME] = your surname.
- Deadline = 4th December at 5pm Eastern Standard Time. (1607119200 UTC)

Resources

- Thesis overleaf template: <https://www.overleaf.com/read/vdtvfvkbbxdn>
- Homework upload folder:
<https://drive.google.com/drive/u/0/folders/1XtkeT6fETJcbEDAKY7Lg4aWvxIxs19QC>
- PDF copies of lectures:
<https://drive.google.com/drive/u/0/folders/1rbbSEd2jqTWIDNBmyYzn3cyRHnhH7HfM>

Making a Figure

- See Article: [Ten Simple Rules for Better Figures](#)

Rougier NP, Droettboom M, Bourne PE (2014) Ten Simple Rules for Better Figures. PLOS Computational Biology 10(9): e1003833. <https://doi.org/10.1371/journal.pcbi.1003833>

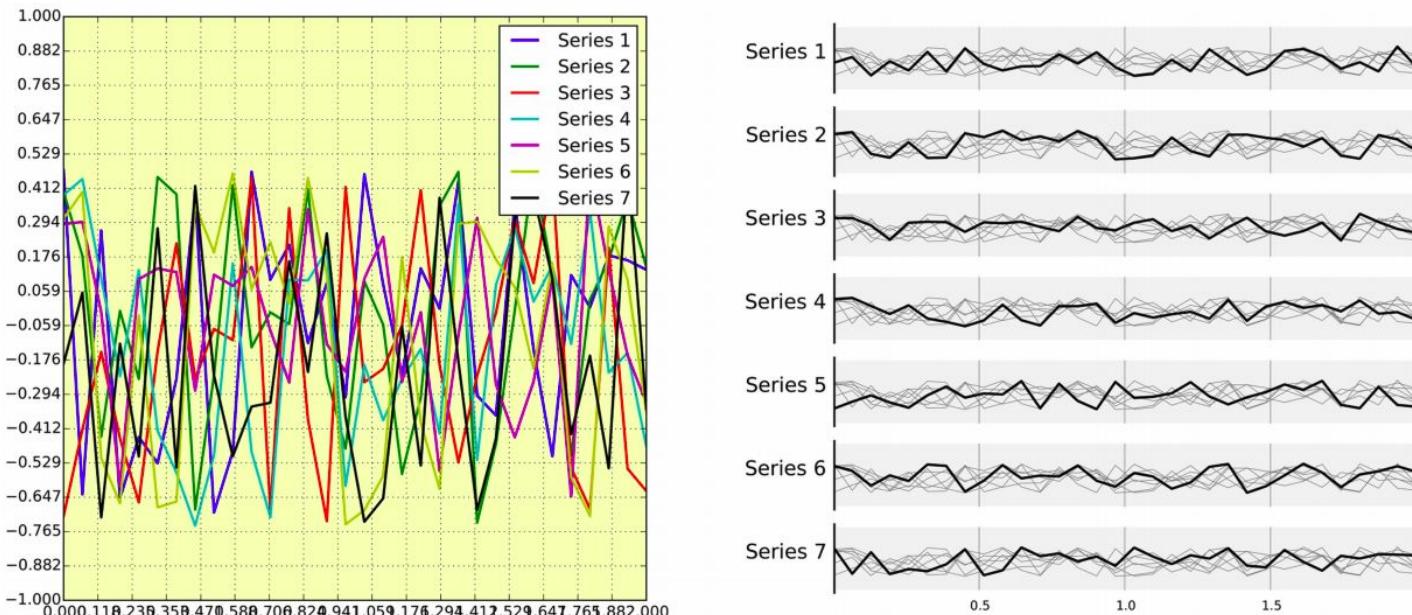


Figure 7. Avoid chartjunk. We have seven series of samples that are equally important, and we would like to show them all in order to visually compare them (exact signal values are supposed to be given elsewhere). The left figure demonstrates what is certainly one of the worst possible designs. All the curves cover each other and the different colors (that have been badly and automatically chosen by the software) do not help to distinguish them. The legend box overlaps part of the graphic, making it impossible to check if there is any interesting information in this area. There are far too many ticks: x labels overlap each other, making them unreadable, and the three-digit precision does not seem to carry any significant information. Finally, the grid does not help because (among other criticisms) it is not aligned with the signal, which can be considered discrete given the small number of sample points. The right figure adopts a radically different layout while using the same area on the sheet of paper. Series have been split into seven plots, each of them showing one series, while other series are drawn very lightly behind the main one. Series labels have been put on the left of each plot, avoiding the use of colors and a legend box. The number of x ticks has been reduced to three, and a thin line indicates these three values for all plots. Finally, y ticks have been completely removed and the height of the gray background boxes indicate the [-1,+1] range (this should also be indicated in the figure caption if it were to be used in an article).

doi:10.1371/journal.pcbi.1003833.g007

More tips on figure creation & quality

- Quick checklist:
<https://www.annaclemens.com/blog/figure-graph-data-vizualisation-plot-scientific-paper>
- Quality: <https://b.nanes.org/figures/>

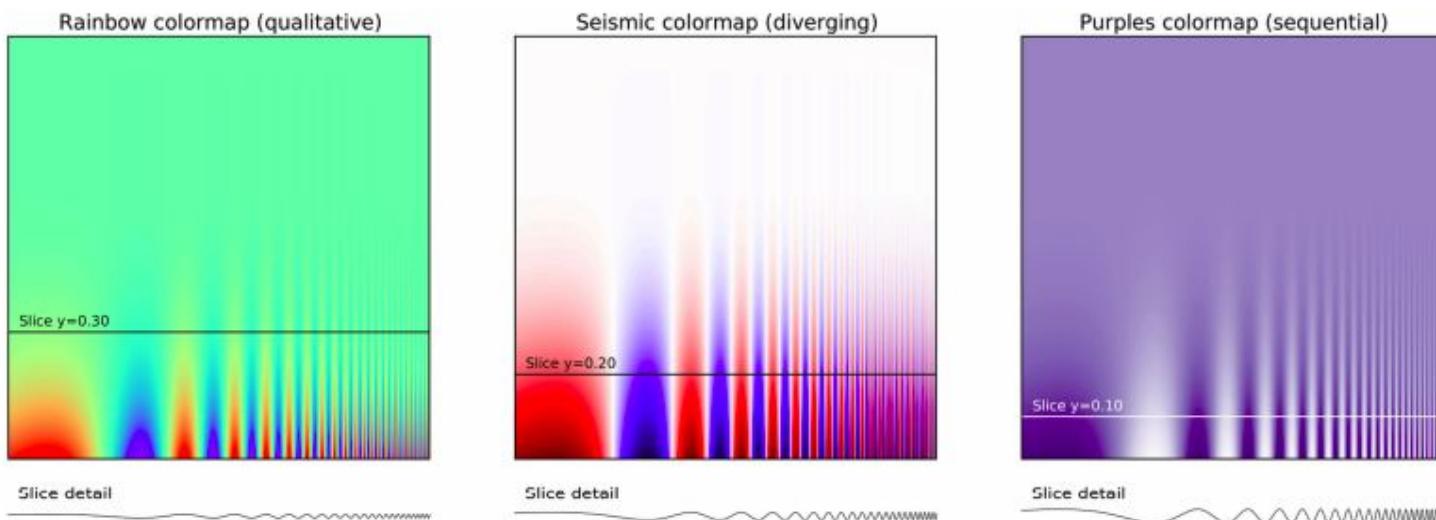


Figure 5. Use color effectively. This figure represents the same signal, whose frequency increases to the right and intensity increases towards the bottom, using three different colormaps. The rainbow colormap (qualitative) and the seismic colormap (diverging) are equally bad for such a signal because they tend to hide details in the high frequency domain (bottom-right part). Using a sequential colormap such as the purple one, it is easier to see details in the high frequency domain. Adapted from [5].
doi:10.1371/journal.pcbi.1003833.g005

Making a Table

- See Article

<https://www.editage.com/insights/tips-on-effective-use-of-tables-and-figures-in-research-papers>

Tips on effective use of tables and figures in research papers

Popular · This article is in Tables & Figures



Velany Rodrigues

Nov 04, 2013

840.6k views

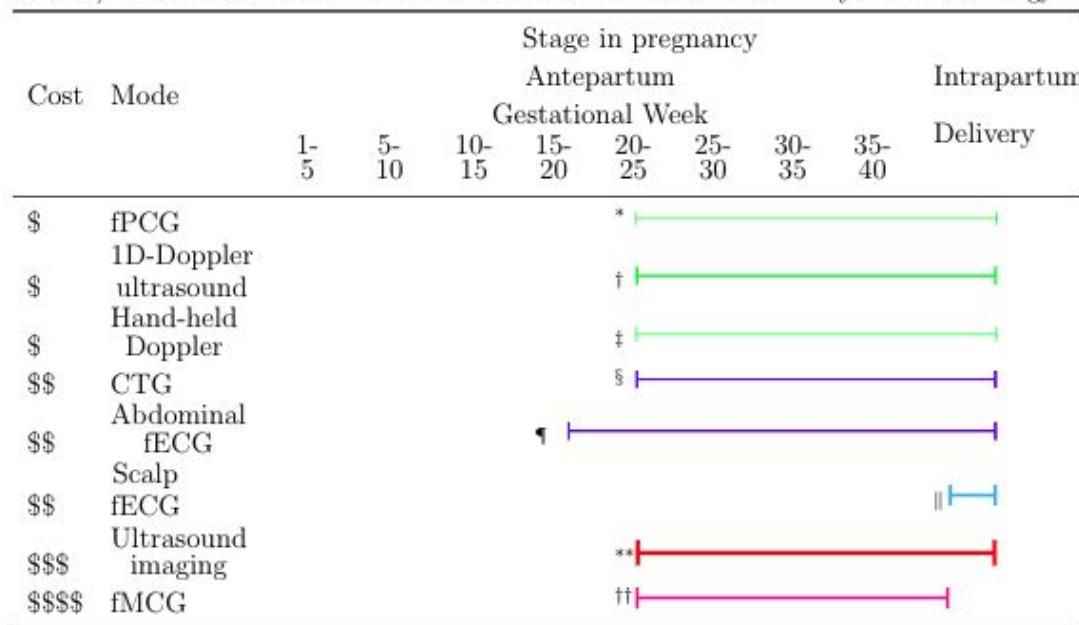
Reading time
11 mins

Key takeaways:

- Tables and figures are great tools to present sizeable amounts of complex data in a space-saving, easy-to-understand way.
- Decide when to use a table, a figure, or text depending on the type of data you need to present and what your journal guidelines recommend.
- Follow these guidelines for framing table and figure and titles, representing symbols within tables and figures, and ensuring that your artwork is clutter-free and visually appealing.

Making a Table

Table 1: Comparison of fetal cardiac monitoring methods. The first column presents a four-point ordinal scale of medical equipment cost, from low (\$) to extremely high (\$\$\$\$). The horizontal line indicates when, during pregnancy, the technology can be used. The color of the line indicates the time required for training operators (green: low; blue: moderate; cyan: considerable; red: high; magenta: extreme). The thickness of the line indicates the relative evidence for the utility of each technology.



* GA \geq 24 weeks (Váradyi et al., 2003).

† GA \geq 20 weeks (Peters et al., 2001).

‡ GA \geq 20 weeks (Peters et al., 2001).

§ GA \geq 20 weeks (Grivell et al., 2015).

¶ GA \geq 18 weeks (Sameni and Clifford, 2010).

|| Intrapartum (GA \geq 36 weeks) (Norén et al., 2006).

** GA \geq 20 weeks (World Health Organization, 2016b).

†† GA \geq 20 weeks (Peters et al., 2001).

Example of a meta-review table

Table 2. Summary of the major heart sound segmentation works. *Se*: sensitivity, *P+*: positive predictivity and *Acc*: accuracy.

Author	Subject type	Subject number	Recording number	Recording length	Cycle number	Sample rate (Hz)	Segmentation results		
							Se (%)	P+ (%)	Acc (%)
<i>Envelope-based method</i>									
(Liang <i>et al.</i> , 1997a)	Normal and pathological children	..	37	Each 7-12 s	515	11,025	93
(Liang <i>et al.</i> , 1997b)	Normal and pathological children	..	77	Each 6-13 s	1,165	11,025	93
(Moukadem <i>et al.</i> , 2013)	Normal Pathological	.. 45	80	Each 6-12 s	..	8,000	96 97	95 95
(Sun <i>et al.</i> , 2014)	Normal Pathological	.. 76	.. 23	Total 600 s Total 7,730 s	..	44,100	96.69
MHSDB		..		Total 1,497 s					
(Choi and Jiang, 2008)	Normal Pathological	500	100 88.2
(Yan <i>et al.</i> , 2010)	Normal and pathological	..	9	Each < 5 s	99.0
(Ari <i>et al.</i> , 2008)	Normal and pathological	71	71	..	357	Varied	97.47
<i>Feature-based method</i>									
(Naseri and Homaeinezhad, 2013)	Pathological	Total 42 min	..	4,000	99.00	98.60	..
(Kumar <i>et al.</i> , 2006)	Pathological	55	55	Each < 120 s	7,530	44,100	97.95	98.20	..
(Varghees and Ramachandran, 2014)	Normal and pathological	..	64	Each < 10 s	701	Varied	99.43	93.56	..
(Pedrosa <i>et al.</i> , 2014)	Pathological adults and PASCAL database	72	72	Each 60 s	89.2	98.6	..
(Vepa <i>et al.</i> , 2008)	Normal and pathological	166	84.0
(Papadaniil and Hadjileontiadis, 2014)	Normal and pathological	43	43	..	2,602	44,100	83.05
(Gharehbaghi <i>et al.</i> , 2011)	Normal and pathological children	120	120	Each 10 s	1,976	44,100	S1: 97 S2: 94
<i>Machine learning method</i>									
(Oskiper and Watrous, 2002)	Normal	30	..	Each 20 s	S1: 96.2
(Sepehri <i>et al.</i> , 2010)	Normal and pathological	60	120	Total 1,200 s	93.6

Generator

Like 1.8K

LaTeX

HTML

Text

Markdown

MediaWiki

File ▾ Edit ▾ Table ▾ Column ▾ Row ▾ Cell ▾ Help ▾



Default table style

	A	B	C	D	E
1	d	dd	<u>tyuytuy</u>	tyu	tyuy
2					
3			vc		<u>vcxvvvcxv</u>
4			xvcx		

Generate

Result (click "Generate" to refresh)

```
1 % Please add the following required packages to your document preamble:  
2 % \usepackage[table,xcdraw]{xcolor}  
3 % If you use beamer only pass "xcolor=table" option, i.e. \documentclass[xcolor=table]{beamer}  
4 \begin{table}[]  
5 \begin{tabular}{lllll}  
6 d & dd & tyuytuy & tyu & tyuy \\  
7 & & & \multicolumn{2}{l}{\cellcolor[HTML]{FE0000}} \\  
8 & & \multicolumn{1}{r}{vc} & & \textit{vcxvvvcxv} \\  
9 & \multicolumn{2}{l}{ } & & \multicolumn{1}{c}{xvcx} &  
10 \end{tabular}  
11 \end{table}
```

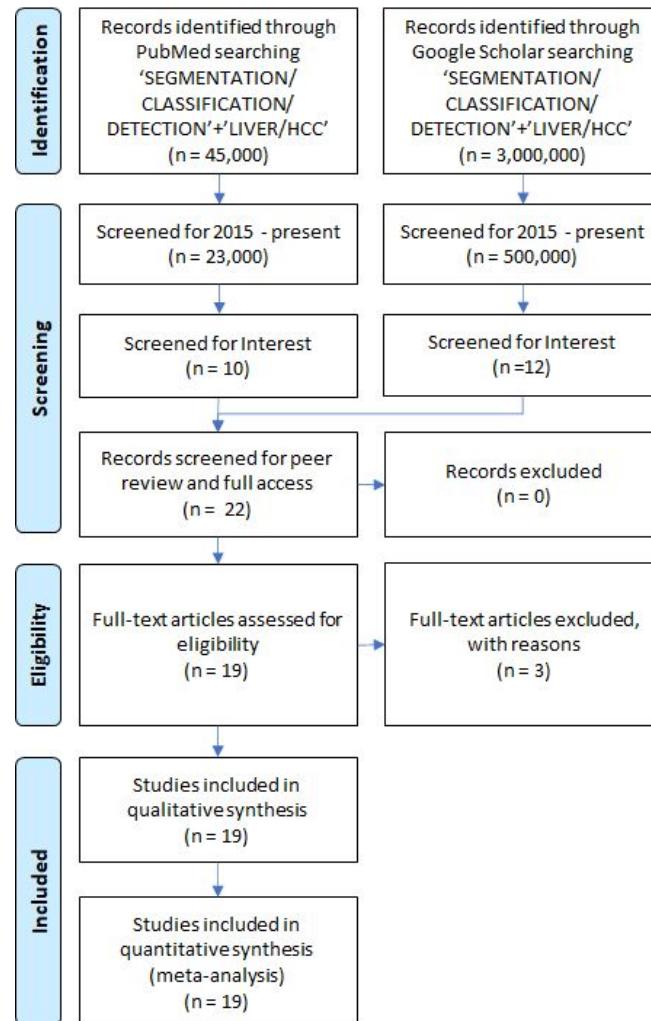
 Escape special TeX symbols (%,&_,#, \$) Compress whitespace Smart output formatting

Extra options... ▾

Table, Slide or Text?

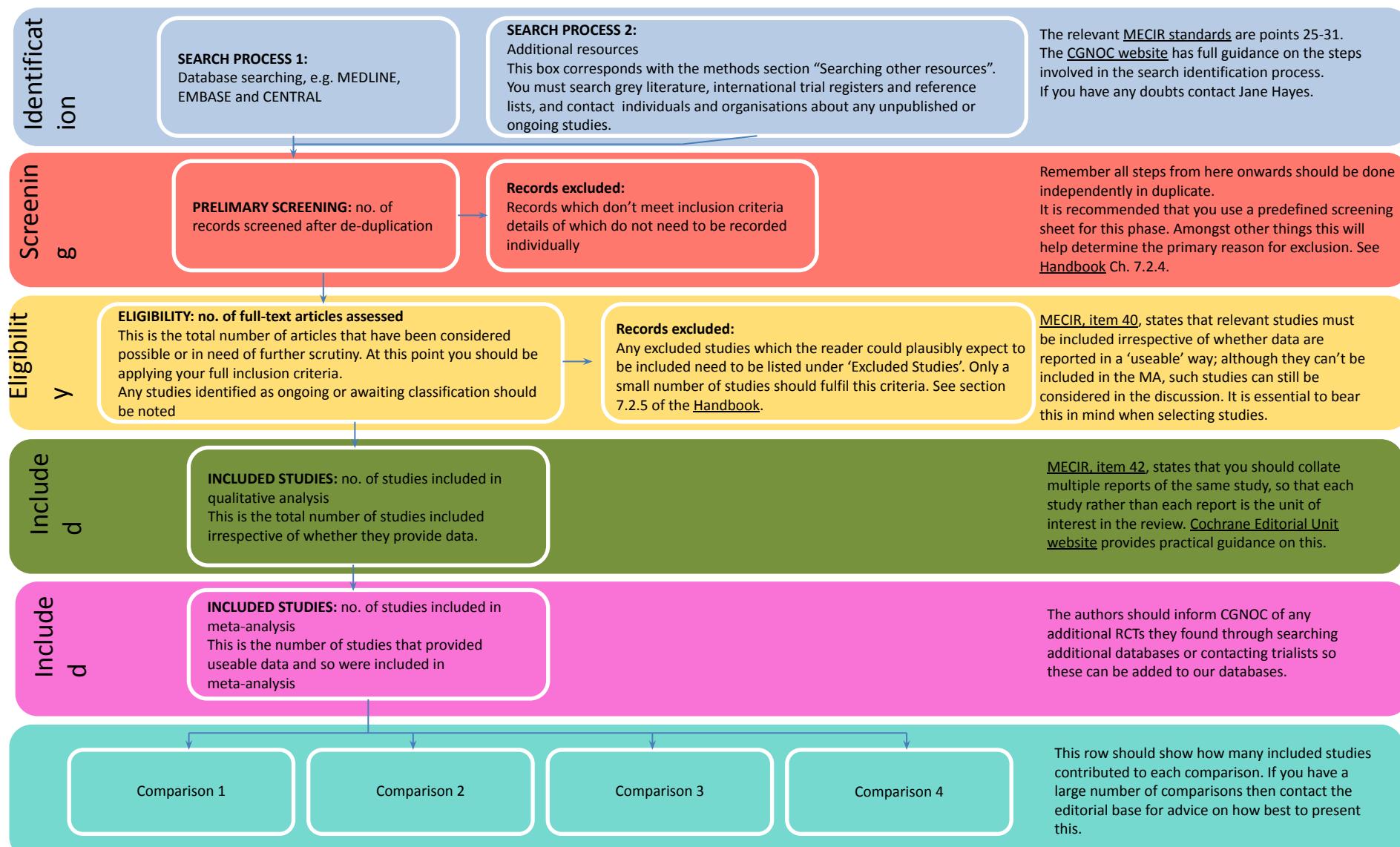
Use a Table	Use a Figure	Use text
To show many and precise numerical values and other specific data in a small space ¹⁷	To show trends, patterns, and relationships across and between data sets when the general pattern is more important than the exact data values ^{8,9,13,16,17,18} (what to use: graphs and data plots)	When you don't have extensive or complicated data to present
To compare and contrast data values or characteristics among related items ^{2,9} or items with several shared characteristics or variables ¹⁹	To summarize research results ⁸ (what to use: graphs, data plots, maps, and pie charts)	When putting your data into a table would mean creating a table with 2 or fewer columns ²
To show the presence or absence of specific characteristics ¹⁹	To present a visual explanation of a sequence of events, procedures, geographic features, or physical characteristics ^{7,18} (what to use: schematic diagrams, images, photographs, and maps)	When the data that you are planning to present is peripheral to the study or irrelevant to the main study findings ^{8,12}

Now let's look at your projects

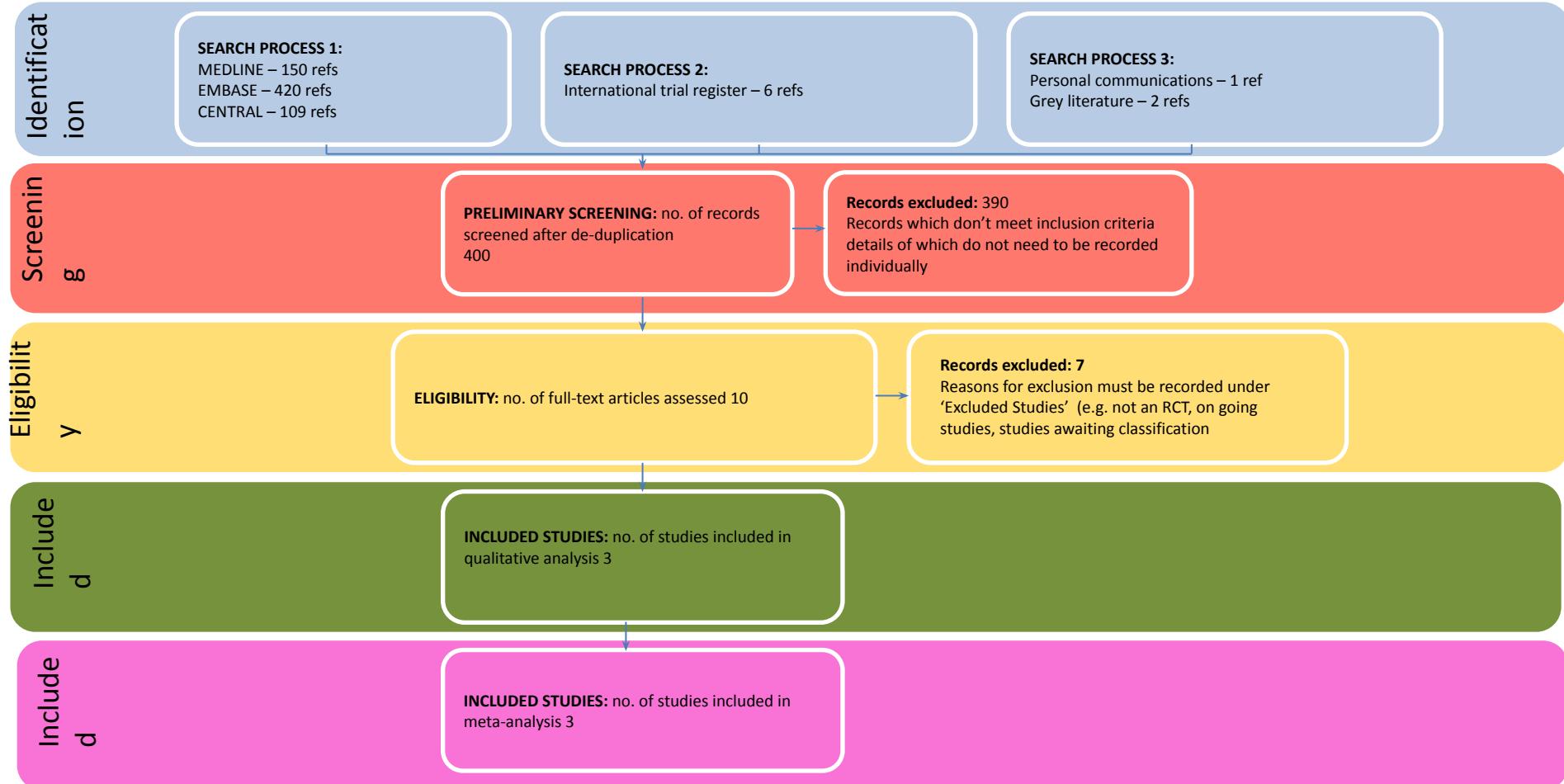


CGNOC PRISMA Study Flow Diagram Advice

According to the [MECIR conduct standards](#), item 41, it is now mandatory for authors to provide a PRISMA study flow diagram in their reviews. It is essential that you use a reference management software in the study selection process, which will help you record information for the below purposes. Please note that for new reviews you should combine all previous searches so that this reflects the culmination of the searching process. For updates where this may not be possible (due to lack of information on previous searches), you can do a diagram for the searches undertaken for the update in question. Further guidance is available on our [website](#) along with contact details for the [editorial base team](#).



CGNOC PRISMA Study Flow Diagram Example



Homework for the semester ...

- Copy the overleaf template: <https://www.overleaf.com/read/vdtvfvkbbxdn>
- Make a copy of the article and remove the contents (no logon necessary). Make sure the project is publicly readable.
- Write a 4-8 page review on a research topic of your choice in this overleaf template, following the formatting instructions and tips on how to make a high quality article.
 - Please include at least one table and one figure.
 - The topic is unimportant, but must be somewhat related to the course.
 - It does not have to be a comprehensive review
 - Your grade will depend on your ability to follow formatting requirements, rather than how comprehensive you survey the field.
 - Pay attention to captions, images, spelling, bibliography, etc.
- Send URL to your friendly TA and gari [at] dbmi.emory.edu with the subject header “[SURNAME] BMI 500 Fall 2020 - Final Course Assignment” by the deadline, where [SURNAME] = your surname.

Final Project Deadline = 3rd December at 5pm Eastern Standard Time. (1638568800 UTC)