

Part I:
Principles of Effective Writing

by K.C.

Principles of Effective Writing

- "In science, the credit goes to the man who convinces the world, not to the man to whom the idea first occurs."

--Sir William Osler

Principles of Effective Writing

- "Writing is an art. But when it is writing to inform it comes close to being a science as well."
- --Robert Gunning, *The Technique of Clear Writing*

Principles of Effective Writing

- Introduction
- What makes good writing?
- What does it take to be a good writer?

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- What makes good writing?

- 1. Good writing communicates an idea clearly and effectively.
- 2. Good writing is elegant and stylish.

Takes having something to say and clear thinking.

Takes time, revision, and a good editor!

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- What makes a good writer?
 - Inborn talent?
 - Years of English and humanities classes?
 - An artistic nature?
 - The influence of alcohol and drugs?
 - Divine inspiration?

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What makes a good writer (outside of poets, maybe):

- Having something to say.
- Logical and clear thinking.
- A few simple, learnable rules of style (the tools we'll learn in this class).

Take home message: Writing to inform is a craft, not an art. Clear, effective writing can be learned!

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- In addition to attending this lecture, other things you can do to become a better writer:
 - Read, pay attention, and imitate.
 - Let go of “academic” writing habits (deprogramming step!)
 - Talk about your research before trying to write about it.
 - Develop a thesaurus habit. Search for the right word rather than settling for any old word.
 - Respect your audience—try not to bore them!
 - Stop waiting for “inspiration.”
 - Accept that writing is hard for everyone.
 - Revise. Nobody gets it perfect on the first try.
 - Learn how to cut ruthlessly. Never become too attached to your words.
 - Find a good editor!

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- Clear writing starts with clear thinking.

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Before you start writing, ask:

“What am I trying to say?”

- When you finish writing, ask:
“Have I said it?”

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Once you know what you're trying to say,
then pay attention to your words!

Today's lesson: Strip your sentences to just
the words that *tell*.

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- “The secret of good writing is to strip every sentence to its cleanest components. Every word that serves no function, every long word that could be a short word, every adverb that carries the same meaning that’s already in the verb, every passive construction that leaves the reader unsure of who is doing what—these are the thousand and one adulterants that weaken the strength of a sentence. And they usually occur in proportion to the education and rank.”
- -- William Zinsser in *On Writing Well*, 1976

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- Famous Example:

- “Such preparations shall be made as will completely obscure all Federal buildings and non-Federal buildings occupied by the Federal government during an air raid for any period of time from visibility by reason of internal or external illumination.”
- (from a government blackout order in 1942)

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- FDR's response:
 - “Tell them that in the buildings where they have to keep the work going to put something across the windows.”

Help!

- This was the first sentence of a recent scientific article in the *Journal of Clinical Oncology* (Introduction section):
- “Adoptive cell transfer (ACT) immunotherapy is based on the ex vivo selection of tumor-reactive lymphocytes, and their activation and numerical expression before reinfusion to the autologous tumor-bearing host.”
- Aaaccckkkk!!!! That sentence does not make me want to read on...

And here's the final sentence from the same article...

- “Current studies in our laboratory are focused on the logistical aspects of generating autologous-cell based patient treatments, the genetic modification of lymphocytes with T-cell receptor genes and cytokine genes to change their specificity or improve their persistence, and the administration of antigen specific vaccines to augment the function of transferred cells.”
- This is academic writing at its finest: boring, unreadable, written to *obscure* rather than to inform!!

Scientific Writing, HRP 214

From: “The joys and pains of writing,” *Le Bon Journal*...

“My professor friend told me that in his academic world, “publish or perish” is really true. He doesn’t care if nobody reads it or understands it as long as it’s published.”

There’s a hint of truth here, *n’est-ce pas?*

Overview of principles...

Today's lessons:

Words:

- 1. Reduce dead weight words and phrases
- 2. Cut, cut, cut; learn to part with your words

Sentences:

- 3. Follow: subject + verb + object (SVO)
- 4. Use strong verbs and avoid turning verbs into nouns
- 5. Eliminate negatives; use positive constructions instead
- 6. Use parallel Construction

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Words

- 1. Reduce dead weight words and phrases
 - Get rid of jargon and repetition

“*Verbose* is not a synonym for *literary*.”

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Examples:

“I would like to assert that the author should be considered to be a buffoon.”



“The author is a buffoon.”

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Examples:

“The expected prevalence of mental retardation, based on the assumption of a normal distribution of intelligence in the population, is stated to be theoretically about 2.5%.”

Principles of Effective Writing

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Principles of Effective Writing

Examples:

“The expected prevalence of mental retardation, based on the assumption of a normal distribution of intelligence in the population, is stated to be theoretically about 2.5%.



“The expected prevalence of mental retardation, if intelligence is normally distributed, is 2.5%.”

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Examples:

“To control infection with *Mycobacterium tuberculosis* (M. tb), a robust cell-mediated immune response is necessary, and deficiency in this response predisposes an individual towards active TB.”



“Deficiency in T-cell-mediated immune response predisposes an individual towards active TB.”

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Examples:

~~“This paper provides a reviews of the basic tenets of cancer biology study design, using as examples studies that illustrate the methodologic challenges or that demonstrate successful solutions to the difficulties inherent in biological research.”~~ and

“This paper reviews cancer biology study design, using examples that illustrate specific challenges and solutions.”

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Hunt down and cast out all unneeded words that might slow your reader.

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**Very, really, quite, basically,
generally**

These words seldom add anything useful. Try the sentence without them and see if it improves.

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Watch out for the verb “to be”

Often “there are” is extra weight.

- There are many students who like writing.
 - Many students like writing.

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Dead weight phrases

- in the event that
- in the nature of
- it has been estimated that
- it seems that
- the point I am trying to make
- what I mean to say is
- it may be argued that

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Dead weight phrases

- for the most part
- for the purpose of
- in a manner of speaking
- in a very real sense
- in my opinion
- in the case of
- in the final analysis

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Clunky phrase

- All three of the
- Fewer in number
- Give rise to
- In all cases
- In a position to
- In close proximity to
- In order to

Equivalent

the three
fewer
cause
always
can
near
to

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Clunky phrase

- A majority of
- A number of
- Are of the same opinion
- At the present moment
- Less frequently occurring

Equivalent

most
many
agree
now
rare

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Beware of

- With the possible exception of
- Due to the fact that
- For the purpose of

Use instead

except
because
for

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Wordy

in spite of the fact that

in the event that

new innovations

one and the same

period of four days

personal opinion

shorter/longer in length

Pointed

although

if

innovations

the same

four days

opinion

shorter/longer

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Constantly be on the lookout for extraneous words that crop up like weeds....

Ask yourself, is this word or phrase necessary?

What happens if I take it out?

Most of the time, you'll find you don't need it!

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- 2. Cut, cut, cut; learn to part with your words

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DON'T BE AFRAID TO CUT

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- Be vigilant and ruthless
- After investing much effort to put words on a page, we often find it hard to part with them.

But fight their seductive pull...

- Try the sentence without the extra words and see how it's better—conveys the same idea with more power

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- Parting with your words...

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Example:

“Brain injury incidence shows two peak periods in almost all reports: rates are the highest in young people, and the elderly.”

More punch→

“Brain injury incidence peaks in the young and the elderly.”

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Sentences

- 3. Follow: subject + verb + *object*
(*active voice!*)

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“Subject verb object”

“Subject verb object”

“Subject verb object”

“Subject verb object”

or just...

“Subject verb”

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The passive voice....

- In passive-voice sentences, the subject is acted upon; the subject doesn't act.
- Passive verb = a form of the verb "to be" + the past participle of the main verb
- The main verb must be a transitive verb (that is, take an object).

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She is loved.

→ Which evokes the question, “Who’s loving her?”

The direct object of the verb.
She’s not the subject since she’s not the one doing the loving.

Form of “to be”

Past participle of a transitive verb: to love (*direct object*).

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President Kennedy **was** **shot** in 1963.

The direct object of the verb. He's not the subject since he's not the one doing the shooting.

Form of "to be"

Past participle of a transitive verb: to shoot (*direct object*).

Active: Oswald **shot** President Kennedy in 1963.

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In the passive voice,

“The agent is AWOL” –*Sin and Syntax*

e.g. “Mistakes were made.”

∴ Nobody is responsible.

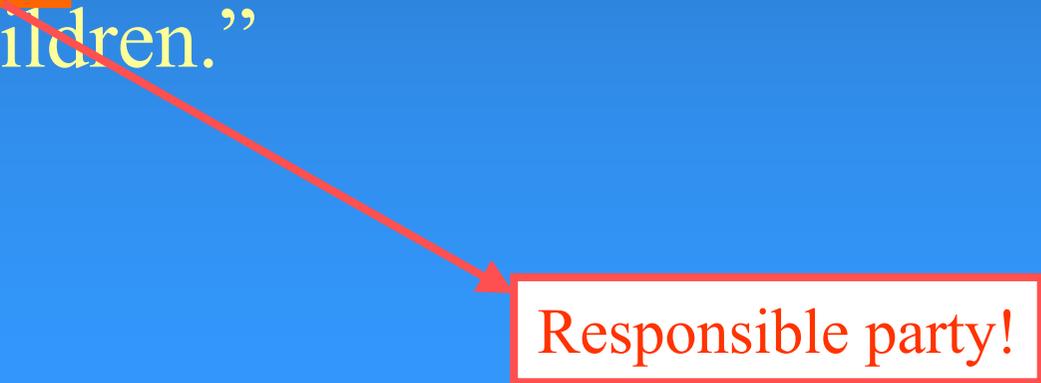
vs. The President made mistakes...

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"Cigarette ads were designed to appeal especially to children."

vs.

"We designed the cigarette ads to appeal especially to children."



Responsible party!

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How do you recognize the passive voice?

Object-Verb-Subject

OR just...

Object-Verb The agent is truly AWOL!

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Examples...

Passive:

My first visit to Boston will always be
remembered by me.

Object

Verb

Subject

Active:

I will always remember my first visit to Boston.

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To turn the passive voice back to the active voice:

Ask: "Who does what to whom?"

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It was found that $1+1$ does not equal 2.

The agent found that $1+1$ does not equal 2.

It was concluded that the data were bogus.

The agent concluded that the data were bogus.

It is believed that the data had been falsified.

The agent believed that the data had been falsified.

A recommendation was made by the DSMB committee that the study be halted.

The DSMB committee recommended that the study be halted.

As is shown in Table 3...

Table 3 shows...

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MYTH: The passive voice is more objective.

It's not more objective, just more vague.

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Passive:

To study DNA repair mechanics, this study on hamster cell DNA was carried out.

More objective? No! More confusing!



Active:

To study DNA repair mechanics, we carried out this study on hamster cell DNA.

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Passive:

General dysfunction of the immune system has been suggested at the leukocyte level in both animal and human studies.

More objective? No! More confusing!



Active:

Both human and animal studies suggest that diabetics have general immune dysfunction at the leukocyte level.

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The Active Voice is

direct, vigorous, natural, and informative.

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A note about breaking the rules...

Most writing rules are guidelines, not laws, and can be broken when the occasion calls for it.

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For example, sometimes it is appropriate to use the passive voice.

- When the action of the sentence is more important than who did it (e.g., materials and methods)
Three liters of fluid is filtered through porous glass beads.
- To emphasize someone or something other than the agent that performed the action
The Clintons were honored at the banquet.
- When the subject is unknown
“The professor was assaulted in the hallways”– they do not know the perpetrator of this heinous crime.

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- 4. Use strong verbs and avoid turning verbs into nouns

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A sentence uses one main verb to convey its central action; without that verb the sentence would collapse.

The verb is the engine that drives the sentence. Dull, lifeless verbs slow the sentence down.

Action verbs reflect the action they were chosen to describe, and help bring the reader into the story.

Scientific Writing, HRP 214

Compare:

“Loud music came from speakers embedded in the walls, and the entire arena moved as the hungry crowd got to its feet.”

With:

“Loud music exploded from speakers embedded in the walls, and the entire arena shook as the hungry crowd leaped to its feet.”

Scientific Writing, HRP 214

Compare:

“Loud music came from speakers embedded in the walls, and the entire arena moved as the hungry crowd got to its feet.”

With:

“Loud music exploded from speakers embedded in the walls, and the entire arena shook as the hungry crowd leaped to its feet.”

Scientific Writing, HRP 214

Pick the right verb!

The WHO reports that approximately two-thirds of the world's diabetics are found in developing countries, and estimates that the number of diabetics in these countries will double in the next 25 year.

→

The WHO estimates that two-thirds of the world's diabetics are found in developing countries, and projects that the number of diabetics in these countries will double in the next 25 years.

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STRONG VERBS carry the main idea of the sentence and sweep the reader along

Put your sentences on a “to be” diet...

Is are was were be been am...

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There are many ways in which we can arrange the Petri dishes.

→ We can arrange the Petri dishes many ways.

There was a long line of bacteria on the plate.

→ Bacteria lined the plate.

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Don't kill verbs and adjectives by turning them into nouns.

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Weak verbs

Obtain estimates of

estimate

Has seen an expansion in

has expanded

Provides a methodologic emphasis

emphasizes methodology

Take an assessment of

assess

Formerly
spunky verbs
transformed
into boring
nouns

Principles of Effective Writing

Provide a review of

review

Offer confirmation of

confirm

Make a decision

decide

Shows a peak

peaks

Principles of Effective Writing

The case of the buried predicate...

subject

confusing garbage

One study of 930 adults with multiple sclerosis (MS) receiving care in one of two managed care settings or in a fee-for-service setting found that only two-thirds of those needing to contact a neurologist for an MS-related problem in the prior 6 months had done so (Vickrey et al 1999).

predicate

Principles of Effective Writing

The case of the buried predicate...

One study found that, of 930 adults with multiple sclerosis (MS) who were receiving care in one of two managed care settings or in a fee-for-service setting, only two-thirds of those needing to contact a neurologist for an MS-related problem in the prior six months had done so (Vickrey et al 1999).

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- 5. Eliminate negatives; use positive constructions instead

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- He was not often on time
 - He usually came late.
- She did not think that studying writing was a sensible use of one's time.
 - She thought studying writing was a waste of time.

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6. Use parallel construction

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Unparallel:

Locusts denuded fields in Utah, rural Iowa was washed away by torrents, and in Arizona the cotton was shriveled by the placing heat.

Vs.

Parallel:

Locusts denuded fields in Utah, torrents washed away rural Iowa, and blazing heat shriveled Arizona's cotton.

From: Strunk and White

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Make a choice and abide by it!

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Pairs of ideas—two ideas joined by “and”, “or”, or “but”—should be written in parallel form.

Cardiac input decreased by 40% but
blood pressure decreased by only 10%.

SVX but SVX

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Pairs of ideas—two ideas joined by “and” “or” or “but”—should be written in parallel form.

We hoped to increase the response and to improve survival.

Infinitive phrase and infinitive phrase.

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Lists of ideas (and number lists of ideas) should be written in parallel form.

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Parallelism

Not Parallel:

If you want to be a good doctor, you must study hard, critically think about the medical literature, and you should be a good listener.

Parallel:

If you want to be a good doctor you must study hard, listen well, and think critically about the medical literature. (imperative, imperative, imperative)

Parallel:

If you want to be a good doctor, you must be a good student, a good listener, and a critical thinker about the medical literature. (noun, noun, noun)

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Parallelism

Not Parallel:

This research follows four distinct phases: (1) establishing measurement instruments (2) pattern measurement (3) developing interventions and (4) the dissemination of successful interventions to other settings and institutions.

Parallel:

This research follows four distinct phases: (1) establishing measurement instruments (2) measuring patterns (3) developing interventions and (4) disseminating successful interventions to other settings and institutions.

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- Some Exercises

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Let's dissect this sentence:

- “It should be emphasized that these proportions generally are not the result of significant increases in moderate and severe injuries, but in many instances reflect mildly injured persons not being seen at a hospital.”

Principles of Effective Writing

- It should be emphasized that these proportions generally are not the result of significant increases in moderate and severe injuries, but in many instances reflect mildly injured persons not being seen at a hospital.

Dead weight!!

Can we use a more informative adjective than a pronoun? What's important about "these" proportions?

More dead weight.

Ask yourself, what does the sentence lose without this qualifier?

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- It should be emphasized that these proportions generally are not the result of significant increases in moderate and severe injuries, but in many instances reflect mildly injured persons not being seen at a hospital.

Watch out for awkward uses of “to be”

“The result of” → Use
“In many instances” → positives.

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- Shifting proportions in injury severity may reflect stricter hospital admission criteria rather than true increases in moderate and severe injuries.

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Really long subject!

“The fear expressed by some teachers that students would not learn statistics well if they were permitted to use canned computer programs has not been realized in our experience. A careful monitoring of achievement levels before and after the introduction of computers in the teaching of our course revealed no appreciable change in students’ performances.”

negatives

wordy

Passive voice

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“The fear expressed by some teachers that students would not learn statistics well if they were permitted to use canned computer programs has not been realized in our experience. A careful monitoring of achievement levels before and after the introduction of computers in the teaching of our course revealed no appreciable change in students’ performances.”

Buried predicate
+ boring verb

“hedge” word

Really long
subject!

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“Many teachers feared that the use of canned computer programs would prevent students from learning statistics. We monitored student achievement levels before and after the introduction of computers in our course and found no detriments in performance.”

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Review of each center's progress in recruitment is important to ensure that the cost involved in maintaining each center's participation is worthwhile.

Principles of Effective Writing

SVO?
When's
the verb
coming?

Review of each center's progress in
recruitment is important to ensure that the
cost involved in maintaining each center's
participation is worthwhile.

Watch vague
descriptors such as
“important” and
“worthwhile”

Clunky phrase

“to be” is a
weak verb

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Possible rewrite:

We should review each center's recruitment progress to make sure its continued participation is cost-effective.

Part II:
Writing a Scientific Manuscript

The Scientific Manuscript

The Abstract, Introduction, and Discussion sections

The Scientific Manuscript

Abstracts

Abstracts (*ab*=out, *trahere*=pull; “to pull out”)

- Overview of the main story
- Gives highlights from each section of the paper
- Limited length (100-300 words, typically)

- Stands on its own
- Used, with title, for electronic search engines
- Most often, the only part people read

The Scientific Manuscript

Abstracts

Gives:

- Background
- Question asked
 - “We asked whether,” “We hypothesized that,” ...etc.
- Experiment(s) done
 - Material studied (molecule, cell line, tissue, organ) or the animal or human population studied
 - The experimental approach or study design and the independent and dependent variables
- Results found
 - Key results found
 - Minimal raw data (prefer summaries)
- The answer to the question asked
- Implication, speculation, or recommendation

The Scientific Manuscript

Abstracts

Abstracts may be structured (with subheadings) or free-form.

The Scientific Manuscript

Introduction

Introduction Section

The Scientific Manuscript

Introduction

Introduction

1. What's known
 2. What's unknown
 - limitations and gaps in previous studies
 3. Your burning question
 4. Your experimental approach
 5. Why your experimental approach is new and different and important
- } Critical literature review

The Scientific Manuscript

Introduction

Tell a story:

- Write it in plain English, not tech-speak.
- Take the reader step by step from what is known to what is unknown. End with your specific question.
(Known→Unknown→Question)
- Emphasize what is new and important about your work.
- Do not state the answer to the research question.
- Do not include results or implications.

Introduction

- **Overweight, Obesity, and Mortality from Cancer in a Prospectively Studied Cohort of U.S. Adults**

Eugenia E. Calle, Ph.D., Carmen Rodriguez, M.D., M.P.H., Kimberly Walker-Thurmond, B.A., and Michael J. Thun, M.D.

What's known

The relations between excess body weight and mortality, not only from all causes but also from cardiovascular disease, are well established.^{1,2,3,4,5,6} Although we have known for some time that excess weight is also an important factor in death from cancer,⁷ our knowledge of the magnitude of the relation, both for all cancers and for cancers at individual sites, and the public health effect of excess weight in terms of total mortality from cancer is limited. Previous studies have consistently shown associations between adiposity and increased risk of endometrium, kidney, gallbladder (in women), breast (in women), and colon (particularly in men).^{8,9,10,11,12} The esophagus has been linked to obesity.^{11,13,14} Data on bladder, pancreas, prostate, liver, cervix, and ovary and on hematopoietic malignancies are inconsistent.^{7,8,9,10,11,15,16,17} The lack of consistency may be due to the limited number of studies (especially those with prospective designs), the wide range and variable categorization of overweight and obesity, confounding factors introduced by reverse causality with respect to smoking-related cancers, and possibly real differences between the effects of overweight and obesity on the incidence of cancer and on the rates of death from some cancers.^{18,19}

“This study will answer the question with better methods.”

We conducted a prospective investigation in a large cohort of U.S. men and women to determine the relations between body-mass index (the weight in kilograms divided by the square of the height in meters) and the risk of death from cancer at specific sites. This cohort has been used previously to examine the association of body-mass index and death from

What's unknown

Gaps/limitations of previous studies

Gaps in
previous
research

The lit.
review

manuscript

What's
unknown/the
research
question

What's
known

Introduction

Exogenous estrogens prevent or substantially reduce the decrease in bone mineral density (BMD) that accompanies menopause [1]. However, it is unclear whether exogenous estrogens, administered as oral contraceptives (OCs), can modify premenopausal BMD. Several studies suggest that exposure to OCs during the premenopausal years has a favorable effect on BMD [2-10], whereas other studies show no effect [11-18].

Past studies of the relationship between OC use and BMD have several limitations. Studies have focused primarily on crude measures of OC use, such as current, past, and never use. Categories combine diverse types of OC use and may reduce the power to detect an effect. Many studies also failed to take into account lifestyle characteristics of study participants. Finally, few studies have considered an effect of OCs on BMD in women of races other than white.

The aim of this study was to evaluate the associations of OCs with spine, hip and whole body BMD in black and white premenopausal women. Our primary hypothesis was that there would be an association between cumulative exposure to estrogen from OCs and BMD.

This study

Scientific Writing, HRP 214

Neurohumoral Features of Myocardial Stunning Due to Sudden Emotional Stress

Ilan S. Wittstein, M.D., David R. Thiemann, M.D., Joao A.C. Lima, M.D., Kenneth L. Baughman, M.D., Steven P. Schulman, M.D., Gary Gerstenblith, M.D., Katherine C. Wu, M.D., Jeffrey J. Rade, M.D., Trinity J. Bivalacqua, M.D., Ph.D., and Hunter C. Champion, M.D., Ph.D. T

New Engl J Med Volume 352:539-548; Feb 10, 2005.

Scientific Writing, HRP 214

The lit.
review

Background/
relevance

The potential consequences of emotional stress are deeply rooted in folk wisdom, as reflected by phrases such as "scared to death" and "a broken heart." In the past decade, cardiac contractile abnormalities and heart failure have been reported after acute emotional stress,^{1,2,3,4,5,6} but the

This study

remains unknown. We evaluated 19

patients with "stress cardiomyopathy" (TAKOTSUBO syndrome) characterized by acute profound myocardial stunning preceding acute emotional stress, in an effort to identify the clinical features that distinguish this syndrome from acute myocardial infarction and the cause of transient stress-induced myocardial dysfunction.

What's
unknown

The Scientific Manuscript

THE DISCUSSION

The Discussion is the section that...

- Gives you the most freedom
- Gives you the most chance to put good writing on display
- Is the most challenging to write

The Scientific Manuscript

The Discussion

Follow your rules for good writing!

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The Discussion

The purpose of the discussion:

- Answer the question posed in the Introduction
- Support your conclusion with details (yours, others)
- Defend your conclusion (acknowledge limits)
- Highlight the broader implications of the work

i.e., What do my results mean and why should anyone care?

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The Discussion

The Introduction moved from general to specific.

The discussion moves from specific to general.

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The Discussion

Elements of the typical discussion section...

- **Key finding (answer to the question(s) asked in Intro.)**
 - Supporting explanation, details (lines of evidence)
 - Possible mechanisms or pathways
 - Is this finding novel?
- **Key secondary findings**
- **Context**
 - Compare your results with other people's results
 - Compare your results with existing paradigms
 - Explain unexpected or surprising findings
- **Strengths and limitations**
- **What's next**
 - Recommended confirmatory studies ("needs to be confirmed")
 - Unanswered questions
 - Future directions
- **The "so what?": implicate, speculate, recommend**
 - Clinical implications of basic science findings
- **Strong conclusion**

EXAMPLE: Samaha FF, Iqbal N, Seshadri P, et al. A low-carbohydrate as compared with a low-fat diet in severe obesity. *N Engl J Med* 2003;348:2074-2081.

INTRODUCTION

The differences in health benefits between a carbohydrate-restricted diet and a calorie- and fat-restricted diet are of considerable public interest. However, there is concern that a carbohydrate-restricted diet will adversely affect serum lipid concentrations.¹ Previous studies demonstrating that healthy volunteers following a low-carbohydrate diet can lose weight have involved few subjects, and few used a comparison group that followed consensus guidelines for weight loss.^{2,3} The reported effects of a carbohydrate-restricted diet on risk factors for atherosclerosis have varied.^{2,3,4} **We performed a study designed to test the hypothesis that severely obese subjects with a high prevalence of diabetes or the metabolic syndrome [a] would have a greater weight loss, [b] without detrimental effects on risk factors for atherosclerosis, while on a carbohydrate-restricted (low-carbohydrate) diet than on a calorie- and fat-restricted (low-fat) diet.**

The Scientific Manuscript

The Discussion

1. We found that severely obese subjects with a high prevalence of diabetes and the metabolic syndrome lost more weight in a six-month period on a carbohydrate-restricted diet than on a fat- and calorie-restricted diet.

[answer to a] The greater weight loss in the low-carbohydrate group suggests a greater reduction in overall caloric intake, rather than a direct effect of macronutrient composition. [mechanisms] However, the explanation for this difference is not clear. Subjects in this group may have experienced greater satiety on a diet with liberal proportions of protein and fat. However, other potential explanations include the simplicity of the diet and improved compliance related to the novelty of the diet. [possible mechanisms/unanswered questions]

The Scientific Manuscript

The Discussion

2. Subjects in the low-carbohydrate group had greater decreases in triglyceride levels than did subjects in the low-fat group; nondiabetic subjects on the low-carbohydrate diet had greater increases in insulin sensitivity, and subjects with diabetes on this diet had a greater improvement in glycemic control. No adverse effects on other serum lipid levels were observed. **[answer to b]** Most studies suggest that lowering triglyceride levels has an overall cardiovascular benefit.^{14,15,16} Insulin resistance promotes such atherosclerotic processes as inflammation,¹⁷ decreased size of low-density lipoprotein particles,¹⁸ and endothelial dysfunction.¹⁹ Impaired glycemic control in subjects with other features of the metabolic syndrome markedly increases the risk of coronary artery disease.²⁰ As expected, we found that the amount of weight lost had a significant effect on the degree of improvement in these metabolic factors.

[comparison to previous studies and paradigms] However, even after adjustment for the differences in weight loss between the groups, assignment to the low-carbohydrate diet predicted greater improvements in triglyceride levels and insulin sensitivity. **[unexpected]** Subjects who lost more than 5 percent of their base-line weight on a carbohydrate-restricted diet had greater decreases in triglyceride levels than those who lost a similar amount of weight while following a calorie- and fat-restricted diet.

[supporting details]

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The Discussion

3. There was a consistent trend across weight-loss strata toward a greater increase in insulin sensitivity in the low-carbohydrate group, although these changes were small and were not significant within each stratum. **[supporting details: dose/response]** Although greater weight loss could not entirely account for the greater decrease in triglyceride levels and increase in insulin sensitivity in the low-carbohydrate group, we cannot definitively conclude that carbohydrate restriction alone accounted for this independent effect. **[mechanisms]** Other uncontrolled variables, such as the types of carbohydrates selected (e.g., the proportion of complex carbohydrates or the ratio of carbohydrate to fiber), or other unknown variables may have contributed to this effect. In addition, more precise measurements of insulin sensitivity than we used would be needed to confirm this effect of a carbohydrate-restricted diet. **[limitations/future studies]**

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The Discussion

4. Many of our subjects were taking lipid-lowering medications and hypoglycemic agents. Although enrolling these subjects introduced confounding variables, it allowed the inclusion of subjects with the obesity-related medical disorders typically encountered in clinical practice. Analyses from which these subjects were excluded still revealed greater improvements in insulin sensitivity and triglyceride levels on a carbohydrate-restricted diet than on a fat- and calorie-restricted diet. [limitations and how they were addressed]

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The Discussion

5. Our study included a high proportion of black subjects, a group previously underrepresented in lifestyle-modification studies. [strength] As compared with the white subjects, the black subjects had a smaller overall weight loss. Future studies should explore whether greater weight loss in this population can be achieved by more effective incorporation of culturally sensitive dietary counseling. [future directions]
6. The high dropout rate in our study occurred very early and affected our findings. The very early dropout of these subjects may indicate that attrition most closely reflected base-line motivation to lose weight, rather than a response to the dietary intervention itself. [limitation]

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The Discussion

7. Taken together, our findings demonstrate that severely obese subjects with a high prevalence of diabetes and the metabolic syndrome lost more weight during six months on a carbohydrate-restricted diet than on a calorie- and fat-restricted diet. The carbohydrate-restricted diet led to greater improvements in insulin sensitivity that were independent of weight loss and a greater reduction in triglyceride levels in subjects who lost more than 5 percent of their base-line weight. **[conclusion; restate answers to a and b]** These findings must be interpreted with caution, however, since the magnitude of the overall weight loss relative to our subjects' severe obesity was small, and it is unclear whether these benefits of a carbohydrate-restricted diet extend beyond six months. Furthermore, the high dropout rate and the small overall weight loss demonstrate that dietary adherence was relatively low in both diet groups. **[big picture]** This study proves a principle and does not provide clinical guidance; given the known benefits of fat restriction, future studies evaluating long-term cardiovascular outcomes are needed before a carbohydrate-restricted diet can be endorsed. **[take-home message]**

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The Discussion: verb tense

Verb Tenses (active!):

Past, when referring to study details, results, analyses, and background research:

- We found that
- They lost more weight than
- Subjects may have experienced
- Miller et al. found

Present, when talking about what the data suggest ...

The greater weight loss suggests

The explanation for this difference is not clear.

Potential explanations include

The Scientific Manuscript Discussion

The Discussion:

- The answer to the key question asked
- What's new
- The context
 - How your results fit into, contradict, or add to what's known or believed
- Strengths and limits of the study
- The “so what?": implicate, speculate, recommend
- Overall conclusion
- Powerful finish

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Methods and Materials,
Results,
Tables and Figures

The Scientific Manuscript Methods

Materials and Methods

The Scientific Manuscript

Methods and Materials

Materials and Methods Overview:

- Give a clear overview of what was done
- Give enough information to replicate the study (like a recipe!)
- Be complete, but minimize complexity!
 - Break into smaller sections with subheads
 - Cite a reference for commonly used methods
 - Display in a flow diagram where possible
- You *may* use jargon and the passive voice more liberally in the M&M section

Writing methods: verb tenses

Report methods in past tense (“we measured”),

But use present tense to describe how data are presented in the paper (“data are summarized as means \pm SD”)

Writing methods: passive voice and *jargon*

For sequencing, *amplicons* were purified with *ExoSAP-Codes*.
The partial nucleotide sequences of the polymerase gene were
aligned with published coronavirus sequences, using
CLUSTAL W for Unix (version 1.7).

*From: Ksiazek et al. A Novel Coronavirus Associated with Severe
Acute Respiratory Syndrome
NEJM 348:1953-1966, May 15, 2003*

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Results

Results

The Scientific Manuscript Results

Results are different from data!

Results=the meaning of the data

Most data belong in figures and tables

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Results

Results:

- Report results pertinent to the main question asked
- Summarize the data (big picture); report trends
- Cite figures or tables that present supporting data

The Scientific Manuscript Results

Does it belong in the text or in a table or figure?

**text is used to point out simple relationships and describe trends*

Examples:

“Over the course of treatment, topiramate was significantly more effective than placebo at improving drinking outcomes on drinks per day, drinks per drinking day, percentage of heavy drinking days, percentage of days abstinent, and log plasma γ -glutamyl transferase ratio (table 3).”

“The total suicide rate for Australian men and women did not change between 1991 and 2000 because marked decreases in older men and women (table 1) were offset by increases in younger adults, especially younger men.⁷”

The Scientific Manuscript Results

Hints:

- Use subheadings
- Include negative and control results
- Give a clear idea of the magnitude of a response or a difference by reporting percent change or the percentage of difference rather than by quoting exact data
- Reserve the term “significant” for statistically significant
- Do not discuss rationale for statistical analyses

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Writing Results: tense

Use past tense, except to talk about how data are presented in the paper.

e.g.:

We found that...

Women were more likely to...

Men smoked more cigarettes than...

BUT:

Figure 1 shows...

Table 1 displays...

The data suggest

The Scientific Manuscript

Writing Results: tense

FROM:

Jarvis et al. Prevalence of hardcore smoking in England, and associated attitudes and beliefs: cross sectional study *BMJ* 2003;326:1061 (17 May)

Example:

Information was available for 7766 current cigarette smokers. Of these, 1216 (16%) were classified as hardcore smokers. Table 1 gives characteristics of all the smokers. The most striking difference was that hardcore smokers were about 10 years older on average and tended to be more dependent on tobacco. Significantly more hardcore smokers had manual occupations, lived in rented accommodation, and had completed their full time education by the age of 16 years. There was no difference by sex.

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Writing Results: active voice

Use active voice

-since you can talk about the subjects of your experiments, “we” can be used sparingly while maintaining the active voice.

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Writing Results: active voice

Comparison with Californian estimates

Using the same definition of hardcore smoking as adopted in the Californian study, **we found** a prevalence of 17% across all age groups and 19% among smokers aged 26 compared with a figure of 5% for this group in the US study. **When we added** the Californian requirement of 15 cigarettes a day to our criteria we found a prevalence of 10% among smokers aged 26, still twice the prevalence in California

FROM:

Jarvis et al. Prevalence of hardcore smoking in England, and associated attitudes and beliefs: cross sectional study *BMJ* 2003;326:1061 (17 May)

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Writing Results: active voice

Differences in attitudes and beliefs by level of dependence

To test whether it was appropriate to exclude a measure of cigarette dependence from our criteria for defining hardcore smoking, we compared attitudes and beliefs by dependence in hardcore and other smokers ([table 4](#)). For most items, beliefs were similar in low and high dependence hardcore smokers but strikingly different from those of other smokers. For example, almost 60% of both low and high dependency non-hardcore smokers agreed that improved health would be a major benefit from quitting whereas among hardcore smokers only 27% of low dependency and 32% of high dependency smokers agreed. Similar differentiation in beliefs by hardcore smoking status, but not dependence level, emerged for other items, especially those related to health.

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Tables and Figures

Tables and Figures

The Scientific Manuscript

Tables and Figures

Editors (and readers) look first (and maybe only) at titles, abstracts, and Tables and Figures!

Like the abstract, figures and tables should stand alone and tell a complete story.

The Scientific Manuscript Tables

Tables

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Table Titles and Footnotes

Titles:

- Identify the specific topic or point of the table
- Use the same key terms in the title, the column headings, and the text of the paper
- Keep it brief

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Table Titles and Footnotes

Footnotes:

- **Use superscript symbols to identify footnotes, according to journal guidelines:**
 - A standard series is: *, †, ‡, §, #, **, ††, etc.
- **Use footnotes to explain statistically significant differences**
 - E.g., * $p < .01$ vs. control by ANOVA
- **Use footnotes to explain experimental details or abbreviations**
 - E.g., EDI is the Eating Disorder Inventory (reference)
 - Amenorrhea was defined as 0-3 periods per year

The Scientific Manuscript Table Formats

Format:

Model your tables from already published tables! Don't re-invent the wheel!!

- **Use three horizontal lines: one above the column headings, one below the column heading, and one below the data**
- **Use a short horizontal line to group subheadings under a heading**
- **Follow journal guidelines RE:**
 - roman or arabic numbers;
 - centered or flush left table number, title, column, headings, and data;
 - capital letters and italics;
 - the placement of footnotes;
 - the type of footnote symbols

Tables: baseline, descriptive data

Three horizontal lines

TABLE 1. BASE-LINE CHARACTERISTICS OF THE WOMEN WHO UNDERWENT RADICAL MASTECTOMY AND THOSE WHO UNDERWENT BREAST-CONSERVING THERAPY.

CHARACTERISTIC	RADICAL MASTECTOMY (N=349)	BREAST-CONSERVING THERAPY (N=352)	P VALUE
	percent		
Premenopausal	53.9	56.8	0.4
Tumor <1 cm in diameter*	44.4	46.0	0.7
Tumor in upper or central quadrant	72.4	75.8	0.3
Tumor in lower quadrant	27.6	24.2	0.3
Previous biopsy	13.7	14.8	0.7
No. of axillary-node metastases	24.6	27.0	0.5
1-3	18.9	21.9	0.3
>3	5.7	5.1	0.7

*Information on tumor size was missing for 53 women (22 in the radical-mastectomy group and 31 in the group that received breast-conserving therapy).

Table 1. Base-Line Characteristics of the Women Who Underwent Radical Mastectomy and Those Who Underwent Breast-Conserving Therapy.

The Scientific Manuscript Figures

Three varieties of Figures:

- **Primary evidence**
 - electron micrographs, gels, photographs, etc.
 - indicates data quality
- **Graphs**
 - line graphs, bar graphs, scatter plots, histograms, boxplots, etc.
- **Drawings and diagrams**
 - illustrate experimental set-up
 - indicate flow of experiments or participants
 - indicate relationships or cause and effect or a cycle
 - give a hypothetical model

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Figure Legends

****Allows the figure to stand alone.**

Contains:

1. Brief title
2. Experimental details
3. Definitions of symbols or line/bar patterns
4. Statistical information

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Graphs

- line graphs
- scatter plots
- bar graphs
- individual-value bar graphs
- histograms
- box plots
- relative risks
- survival curves

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Figures

Graphs

- line graphs

*Used to show trends over time or age
(can display group means or individuals)

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Figures

Graphs

- bar graphs

*Used to compare groups at one time point

*Tells a quick visual story

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Figures

Graphs

- scatter plots

*Used to show relationships between two variables (particularly linear correlation)

*Allows reader to see individual data points=more information!

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Graphs

- Confidence intervals/relative risks

- To show dose-response of a protective or harmful factor

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References

- **Use a computerized bibliographic program.**
- **Follow journal guidelines (may request alphabetical listing or order of appearance in the text).**
- **Follow standard abbreviations (can be found online).**
- **Some journals limit number of references allowed.**

References & Further Reading

- Strunk and White. *The elements of style*.
- Constance Hale. *Sin and syntax*.
- William Zinsser. *On writing well*.
- Matthews, Bowen, and Matthews. *Successful science writing*.